MELSEC System Q

Motion Controller

User's Manual

Q172CPU
Q173CPU

Art. no.: 143715
01 05 2002
IB(NA)-0300040-B

● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using this equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the module properly.
These precautions apply only to this equipment. Refer to the Users manual of the CPU module to use for a description of the PLC system safety precautions.
These SAFETY PRECAUTIONS classify the safety precautions into two categories: "DANGER" and "CAUTION".

! DANGER	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Depending on circumstances, procedures indicated by ⚠ CAUTION may also be linked to serious results.
In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

For Safe Operations

1. Prevention of electric shocks

⚠ DANGER

- Never open the front case or terminal covers while the power is ON or the unit is running, as this may lead to electric shocks.
- Never run the unit with the front case or terminal cover removed. The high voltage terminal and charged sections will be exposed and may lead to electric shocks.
- Never open the front case or terminal cover at times other than wiring work or periodic inspections even if the power is OFF. The insides of the Motion controller and servo amplifier are charged and may lead to electric shocks.
- When performing wiring work or inspections, turn the power OFF, wait at least ten minutes, and then check the voltage with a tester, etc.. Failing to do so may lead to electric shocks.
- Be sure to ground the Motion controller, servo amplifier and servomotor. (Ground resistance : 100 Ω or less) Do not ground commonly with other devices.
- The wiring work and inspections must be done by a qualified technician.
- Wire the units after installing the Motion controller, servo amplifier and servomotor. Failing to do so may lead to electric shocks or damage.
- Never operate the switches with wet hands, as this may lead to electric shocks.
- Do not damage, apply excessive stress, place heavy things on or sandwich the cables, as this may lead to electric shocks.
- Do not touch the Motion controller, servo amplifier or servomotor terminal blocks while the power is ON, as this may lead to electric shocks.
- Do not touch the internal power supply, internal grounding or signal wires of the Motion controller and servo amplifier, as this may lead to electric shocks.

2. For fire prevention

⚠ CAUTION

- Install the Motion controller, servo amplifier, servomotor and regenerative resistor on inflammable material. Direct installation on flammable material or near flammable material may lead to fires.
- If a fault occurs in the Motion controller or servo amplifier, shut the power OFF at the servo amplifier's power source. If a large current continues to flow, fires may occur.
- When using a regenerative resistor, shut the power OFF with an error signal. The regenerative resistor may abnormally overheat due to a fault in the regenerative transistor, etc., and may lead to fires.
- Always take heat measures such as flame proofing for the inside of the control panel where the servo amplifier or regenerative resistor is installed and for the wires used. Failing to do so may lead to fires.

3. For injury prevention

⚠ CAUTION
● Do not apply a voltage other than that specified in the instruction manual on any terminal. Doing so may lead to destruction or damage. ● Do not mistake the terminal connections, as this may lead to destruction or damage. ● Do not mistake the polarity (+ / -), as this may lead to destruction or damage. ● Do not touch the servo amplifier's heat radiating fins, regenerative resistor and servomotor, etc., while the power is ON and for a short time after the power is turned OFF. In this timing, these parts become very hot and may lead to burns. ● Always turn the power OFF before touching the servomotor shaft or coupled machines, as these parts may lead to injuries. ● Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.

4. Various precautions

Strictly observe the following precautions.

Mistaken handling of the unit may lead to faults, injuries or electric shocks.

(1) System structure

⚠ CAUTION
● Always install a leakage breaker on the Motion controller and servo amplifier power source. ● If installation of a magnetic contactor for power shut off during an error, etc., is specified in the instruction manual for the servo amplifier, etc., always install the magnetic contactor. ● Install the emergency stop circuit externally so that the operation can be stopped immediately and the power shut off. ● Use the Motion controller, servo amplifier, servomotor and regenerative resistor with the combinations listed in the instruction manual. Other combinations may lead to fires or faults. ● If safety standards (ex., robot safety rules, etc.,) apply to the system using the Motion controller, servo amplifier and servomotor, make sure that the safety standards are satisfied. ● Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system. ● In systems where coasting of the servomotor will be a problem during the emergency stop, the forced stop, servo OFF or when the power is shut OFF, use dynamic brakes. ● Make sure that the system considers the coasting amount even when using dynamic brakes.

⚠ CAUTION

- In systems where perpendicular shaft dropping may be a problem during the emergency stop, the forced stop and servo OFF or when the power is shut OFF, use both dynamic brakes and magnetic brakes.
- The dynamic brakes must be used only during the emergency stop, the forced stop and errors where servo OFF occurs. These brakes must not be used for normal braking.
- The brakes (magnetic brakes) assembled into the servomotor are for holding applications, and must not be used for normal braking.
- The system must have a mechanical allowance so that the machine itself can stop even if the stroke limits switch is passed through at the max. speed.
- Use wires and cables that have a wire diameter, heat resistance and bending resistance compatible with the system.
- Use wires and cables within the length of the range described in the instruction manual.
- The ratings and characteristics of the parts (other than Motion controller, servo amplifier and servomotor) used in a system must be compatible with the Motion controller, servo amplifier and servomotor.
- Install a cover on the shaft so that the rotary parts of the servomotor are not touched during operation.
- There may be some cases where holding by the magnetic brakes is not possible due to the life or mechanical structure (when the ball screw and servomotor are connected with a timing belt, etc.). Install a stopping device to ensure safety on the machine side.

(2) Parameter settings and programming

⚠ CAUTION

- Set the parameter values to those that are compatible with the Motion controller, servo amplifier, servomotor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.
- The regenerative resistor model and capacity parameters must be set to values that conform to the operation mode, servo amplifier and servo power supply module. The protective functions may not function if the settings are incorrect.
- Set the mechanical brake output and dynamic brake output validity parameters to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Set the stroke limit input validity parameter to a value that is compatible with the system application. The protective functions may not function if the setting is incorrect.

⚠ CAUTION

- Set the servomotor encoder type (increment, absolute position type, etc.) parameter to a value that is compatible with the system application. The protective functions may not function if the setting is incorrect.
- Set the servomotor capacity and type (standard, low-inertia, flat, etc.) parameter to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Set the servo amplifier capacity and type parameters to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Use the program commands for the program with the conditions specified in the instruction manual.
- Set the sequence function program capacity setting, device capacity, latch validity range, I/O assignment setting, and validity of continuous operation during error detection to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Some devices used in the program have fixed applications, so use these with the conditions specified in the instruction manual.
- The input devices and data registers assigned to the link will hold the data previous to when communication is terminated by an error, etc. Thus, an error correspondence interlock program specified in the instruction manual must be used.
- Use the interlock program specified in the special function module's instruction manual for the program corresponding to the special function module.

(3) Transportation and installation

⚠ CAUTION

- Transport the product with the correct method according to the weight.
- Use the servomotor suspension bolts only for the transportation of the servomotor. Do not transport the servomotor with machine installed on it.
- Do not stack products past the limit. When transporting the Motion controller or servo amplifier, never hold the connected wires or cables.
- When transporting the servomotor, never hold the cables, shaft or detector.
- When transporting the Motion controller or servo amplifier, never hold the front case as it may fall off.
- When transporting, installing or removing the Motion controller or servo amplifier, never hold the edges.
- Install the unit according to the instruction manual in a place where the weight can be withstood.

⚠ CAUTION

- Do not get on or place heavy objects on the product.
- Always observe the installation direction.
- Keep the designated clearance between the Motion controller or servo amplifier and control panel inner surface or the Motion controller and servo amplifier, Motion controller or servo amplifier and other devices.
- Do not install or operate Motion controller, servo amplifiers or servomotors that are damaged or that have missing parts.
- Do not block the intake/outtake ports of the servomotor with cooling fan.
- Do not allow conductive matter such as screw or cutting chips or combustible matter such as oil enter the Motion controller, servo amplifier or servomotor.
- The Motion controller, servo amplifier and servomotor are precision machines, so do not drop or apply strong impacts on them.
- Securely fix the Motion controller and servo amplifier to the machine according to the instruction manual. If the fixing is insufficient, these may come off during operation.
- Always install the servomotor with reduction gears in the designated direction. Failing to do so may lead to oil leaks.
- Store and use the unit in the following environmental conditions.

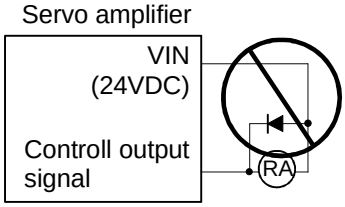
Environment	Conditions	
	Motion controller/Servo amplifier	Servomotor
Ambient temperature	According to each instruction manual.	0°C to +40°C (With no freezing) (32°F to +104°F)
Ambient humidity	According to each instruction manual.	80% RH or less (With no dew condensation)
Storage temperature	According to each instruction manual.	-20°C to +65°C (-4°F to +149°F)
Atmosphere	Indoors (where not subject to direct sunlight). No corrosive gases, flammable gases, oil mist or dust must exist	
Altitude	1000m (3278.69ft.) or less above sea level	
Vibration	According to each instruction manual	

- When coupling with the synchronization encoder or servomotor shaft end, do not apply impact such as by hitting with a hammer. Doing so may lead to detector damage.
- Do not apply a load larger than the tolerable load onto the servomotor shaft. Doing so may lead to shaft breakage.
- When not using the module for a long time, disconnect the power line from the Motion controller or servo amplifier.
- Place the Motion controller and servo amplifier in static electricity preventing vinyl bags and store.
- When storing for a long time, please contact with our sales representative.

(4) Wiring

⚠ CAUTION

- Correctly and securely wire the wires. Reconfirm the connections for mistakes and the terminal screws for tightness after wiring. Failing to do so may lead to run away of the servomotor.
- After wiring, install the protective covers such as the terminal covers to the original positions.
- Do not install a phase advancing capacitor, surge absorber or radio noise filter (option FR-BIF) on the output side of the servo amplifier.
- Correctly connect the output side (terminals U, V, W). Incorrect connections will lead the servomotor to operate abnormally.
- Do not connect a commercial power supply to the servomotor, as this may lead to trouble.
- Do not mistake the direction of the surge absorbing diode installed on the DC relay for the control signal output of brake signals, etc. Incorrect installation may lead to signals not being output when trouble occurs or the protective functions not functioning.



- Do not connect or disconnect the connection cables between each unit, the encoder cable or PLC expansion cable while the power is ON.
- Securely tighten the cable connector fixing screws and fixing mechanisms. Insufficient fixing may lead to the cables combing off during operation.
- Do not bundle the power line or cables.

(5) Trial operation and adjustment

⚠ CAUTION

- Confirm and adjust the program and each parameter before operation. Unpredictable movements may occur depending on the machine.
- Extreme adjustments and changes may lead to unstable operation, so never make them.
- When using the absolute position system function, on starting up, and when the Motion controller or absolute value motor has been replaced, always perform a home position return.

(6) Usage methods

⚠ CAUTION

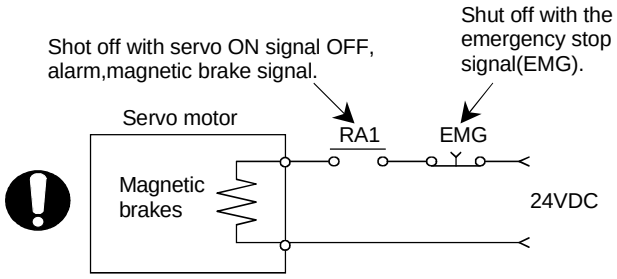
- Immediately turn OFF the power if smoke, abnormal sounds or odors are emitted from the Motion controller, servo amplifier or servomotor.
- Always execute a test operation before starting actual operations after the program or parameters have been changed or after maintenance and inspection.
- The units must be disassembled and repaired by a qualified technician.
- Do not make any modifications to the unit.
- Keep the effect or magnetic obstacles to a minimum by installing a noise filter or by using wire shields, etc. Magnetic obstacles may affect the electronic devices used near the Motion controller or servo amplifier.
- When using the CE Mark-compliant equipment, refer to the "EMC Installation Guidelines" (data number IB(NA)-67339) for the Motion controllers and refer to the corresponding EMC guideline information for the servo amplifiers, inverters and other equipment.
- Use the units with the following conditions.

Item	Conditions			
	Q61P-A1	Q61P-A2	Q63P	Q64P
Input power	100 to 120VAC $^{+10\%}_{-15\%}$ (85 to 132VAC)	200 to 240VAC $^{+10\%}_{-15\%}$ (170 to 264VAC)	24VDC $^{+30\%}_{-35\%}$ (15.6 to 31.2VDC)	100 to 120VAC $^{+10\%}_{-15\%}$ / 200 to 240VAC $^{+10\%}_{-15\%}$ (85 to 132VAC/ 170 to 264VAC)
Input frequency	50/60Hz ±5%			
Tolerable momentary power failure	20ms or less			

(7) Corrective actions for errors

⚠ CAUTION

- If an error occurs in the self diagnosis of the Motion controller or servo amplifier, confirm the check details according to the instruction manual, and restore the operation.
- If a dangerous state is predicted in case of a power failure or product failure, use a servomotor with magnetic brakes or install a brake mechanism externally.
- Use a double circuit construction so that the magnetic brake operation circuit can be operated by emergency stop signals set externally.



⚠ CAUTION

- If an error occurs, remove the cause, secure the safety and then resume operation after alarm seleasl.
- The unit may suddenly resume operation after a power failure is restored, so do not go near the machine. (Design the machine so that personal safety can be ensured even if the machine restarts suddenly.)

(8) Maintenance, inspection and part replacement

⚠ CAUTION

- Perform the daily and periodic inspections according to the instruction manual.
- Perform maintenance and inspection after backing up the program and parameters for the Motion controller and servo amplifier.
- Do not place fingers or hands in the clearance when opening or closing any opening.
- Periodically replace consumable parts such as batteries according to the instruction manual.
- Do not touch the lead sections such as ICs or the connector contacts.
- Do not place the Motion controller or servo amplifier on metal that may cause a power leakage or wood, plastic or vinyl that may cause static electricity buildup.
- Do not perform a megger test (insulation resistance measurement) during inspection.
- When replacing the Motion controller or servo amplifier, always set the new module settings correctly.
- When the Motion controller or absolute value motor has been replaced, carry out a home position return operation using one of the following methods, otherwise position displacement could occur.
  1) After writing the servo data to the Motion controller using programming software, switch on the power again, then perform a home position return operation.
  2) Using the backup function of the programming software, load the data backed up before replacement.
- After maintenance and inspections are completed, confirm that the position detection of the absolute position detector function is correct.
- Do not short circuit, charge, overheat, incinerate or disassemble the batteries.
- The electrolytic capacitor will generate gas during a fault, so do not place your face near the Motion controller or servo amplifier.
- The electrolytic capacitor and fan will deteriorate. Periodically replace these to prevent secondary damage from faults. Replacements can be made by our sales representative.

(9) Disposal

⚠ CAUTION
● Dispose of the product as general industrial waste. ● Do not disassemble the parts of the Motion controller, servo amplifier or servomotor. ● Dispose of the battery according to local laws and regulations.

(10) General cautions

⚠ CAUTION
● All drawings provided in the instruction manual show the state with the covers and safety partitions removed to explain detailed sections. When operating the product, always return the covers and partitions to the designated positions, and operate according to the instruction manual.

REVISIONS

* The manual number is given on the bottom left of the back cover.

Print Date	* Manual Number	Revision
Nov., 2001	IB(NA)-0300040-A	First edition
May., 2002	IB(NA)-0300040-B	[Addition model] Q173CPUN/Q172CPUN, MR-J2M-B, A10BD-PCF [Addition function] • For Windows 2000 • ROM operation •MODE LED Installation mode/ROM writing mode •BOOT LED Installation mode/ROM writing mode [Partial correction]

Japanese Manual Number IB(NA)-0300021

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INTRODUCTION

Thank you for choosing the Q173CPU(N)/Q172CPU(N) Motion Controller.
Please read this manual carefully so that equipment is used to its optimum.

CONTENTS

Safety Precautions ..... A- 1
Revisions A-11
Contents A-12
About Manuals A-15

1. OVERVIEW 1- 1 to 1- 2

1.1 Overview 1- 1

2. SYSTEM CONFIGURATION 2- 1 to 2-70

2.1 Motion System Configuration 2- 1
2.1.1 Q173CPU(N) System overall configuration 2- 8
2.1.2 Q172CPU(N) System overall configuration 2- 9
2.1.3 Function explanation of the Q173CPU(N)/Q172CPU(N) Motion CPU modules 2-10
2.1.4 Restrictions on motion systems 2-11
2.2 System Configuration Equipment 2-13
2.3 General Specifications 2-20
2.4 Specifications of Equipment and Settings 2-22
2.4.1 Q173CPU(N)/Q172CPU(N) 2-22
2.4.2 Power supply module 2-28
2.4.3 Base unit and extension cable 2-34
2.4.4 Q172LX Servo external signals interface module 2-37
2.4.5 Q172EX Serial absolute synchronous encoder interface module 2-42
2.4.6 Q173PX Manual pulse generator interface module 2-49
2.4.7 Manual pulse generator/Serial absolute synchronous encoder 2-56
2.4.8 Connection method with SSCNET cables and termination connector 2-57
2.4.9 External battery 2-67
2.4.10 Cooling fan unit (Q170FAN) (Q173CPU/Q172CPU only) 2-69

3. DESIGN 3- 1 to 3-16

3.1 System Designing Procedure 3- 1
3.2 External Circuit Design 3- 4
3.2.1 Power supply circuit design 3- 8
3.2.2 Safety circuit design 3- 9
3.3 Layout Design within The Control Panel 3-11
3.3.1 Installation environment 3-11
3.3.2 Layout design of the base units 3-12
3.3.3 Calculating heat generation by Motion controller 3-13
3.4 Design Checklist 3-16

4. INSTALLATION AND WIRING 4- 1 to 4-16

4.1 Module Installation 4- 1
4.1.1 Instructions for handling 4- 1
4.1.2 Instructions for installation of the base unit 4- 3
4.1.3 Installation and removal of module 4- 5
4.2 Installation and Removal of Cable 4- 7
4.2.1 Installation and removal of the SSCNET cable 4- 7
4.2.2 2 Installation and removal of the battery cable 4- 8
4.3 Installation of the Serial Absolute Synchronous Encoder 4- 9
4.4 Replacement of the Cooling fan unit (Q170FAN) (Q173CPU/Q172CPU only) 4-11
4.5 Wiring 4-12
4.5.1 Instructions for wiring 4-12
4.5.2 Wiring to the power supply module 4-15
4.6 Installation/Wiring Checklist 4-16

5. TRIAL RUN AND ADJUSTMENT 5- 1 to 5- 8

5.1 Checklist before Trial Operation 5- 1
5.2 Trial Run and Adjustment Procedure 5- 2
5.3 Operating System Installation Procedure 5- 7
5.4 Trial Run and Adjustment Checklist 5- 8

6. INSPECTION AND MAINTENANCE 6- 1 to 6-26

6.1 Maintenance Works 6- 2
6.1.1 Inspection and maintenance 6- 2
6.2 Daily Inspection 6- 4
6.3 Periodic Inspection 6- 6
6.4 External Battery 6- 7
6.4.1 Battery service life time 6- 8
6.4.2 Battery replacement procedure 6- 9
6.5 Troubleshooting 6-11
6.5.1 Basics of troubleshooting 6-11
6.5.2 Troubleshooting of Motion CPU module and I/O modules 6-12
6.5.3 I/O modules troubleshooting 6-22
6.6 Error Code 6-25
6.6.1 Procedure for reading error codes 6-25

APPENDICES App- 1 to App-23

APPENDIX 1 Cables....App- 1
APPENDIX 1.1 SSCNET cables....App- 1
APPENDIX 1.2 Serial absolute synchronous encoder cable....App-11
APPENDIX 2 Exterior Dimensions Diagram....App-13
APPENDIX 2.1 CPU module....App-13
APPENDIX 2.2 Servo external signals interface module (Q172LX)....App-16
APPENDIX 2.3 Serial absolute synchronous encoder interface module (Q172EX)....App-16
APPENDIX 2.4 Manual pulse generator interface module (Q173PX)....App-17
APPENDIX 2.5 Power supply module (Q61P-A1, Q61P-A2, Q63P, Q64P)....App-18
APPENDIX 2.6 Dividing unit (Q173DV), Battery unit (Q170BAT)....App-19
APPENDIX 2.7 Connector....App-20
APPENDIX 2.8 Manual pulse generator (MR-HDP01)....App-22
APPENDIX 2.9 Serial absolute synchronous encoder (MR-HENC)....App-22
APPENDIX 2.10 Cooling fan unit (Q170FAN) (Q173CPU/Q172CPU only)....App-23

About Manuals

This manual is only to explain hardware of the Motion controller.

The following manuals are related to this product.

Referring to this list, please request the necessary manuals.

This User's Manual do not describes hardware specification and handling methods of the PLC CPU modules, power supply modules, base unit and I/O module in details.

The above contents, refer to the QCPU (Q Mode) User's Manual and Building Block I/O Module User's Manual.

Related Manuals

	Manual Name	Manual Number (Model Code)
Software of Motion CPU	Q173CPU/Q172CPU Motion controller (SV13/SV22) Programming Manual (Real) This manual explains the servo parameter, positioning instructions, device list and error list. (Optional)	IB-0300043 (1CT782)
	Q173CPU/Q172CPU Motion controller (SV22) Programming Manual (Virtual) This manual describes the dedicated instructions use to the synchronous control by virtual main shaft, mechanical system program create mechanical module. This manual explains the servo parameter, positioning instructions, device list and error list. (Optional)	IB-0300044 (1CT783)
	Q173CPU/Q172CPU Motion controller (SV13/SV22) Programming Manual (Motion SFC) This manual explains the Multiple CPU system configuration, performance specifications, functions, programming, debugging and error codes. (Optional)	IB-0300042 (1CT781)
Software of PLC	QCPU (Q Mode) User's Manual (Function Explanation/Program Fundamentals) This manual explains the functions, programming methods and devices and so on necessary to create programs with the QCPU (Q mode). (Optional)	SH-080038 (13JL98)
	QCPU (Q Mode)/QnA Programming Manual (Common Instructions) This manual describes how to use the sequence instructions, basic instructions, application instructions and micro computer program. (Optional)	SH-080039 (13JF58)
	QCPU (Q Mode)/QnA Programming Manual (PID Control) This manual describes the dedicated instructions used to exercise PID control. (Optional)	SH-080040 (13JF59)
	QCPU (Q Mode)/QnA Programming Manual (SFC) This manual explains the system configuration, performance specifications, functions, programming, debugging, error codes and others of MELSAP3. (Optional)	SH-080041 (13JF60)
Hardware of PLC	QCPU (Q Mode) User's Manual (Hard ware Design/Maintenance and inspection) This manual provides the specifications of the CPU modules, power supply modules, base modules, extension cables, memory cards and others. (Optional)	SH-080037 (13JI97)
	Building Block I/O Module User's Manual This manual provides the specifications of the I/O modules, connector, connector/terminal block conversion modules and others. (Optional)	SH-080042 (13JL99)

MEMO

1. OVERVIEW

1.1 Overview

This User's Manual describes the hardware specifications and handling methods of the Motion Controller's Model Q173CPU(N)/Q172CPU(N) for the Q series PLC Multiple CPU system.
The Manual also describes those items related to the specifications of the option module for the Motion controller, Manual pulse generator, Synchronous encoder, and cable.
In this manual, the following abbreviations are used.

Generic term/ Abbreviation	Description
Q173CPU(N)/Q172CPU(N), Motion CPU or Motion CPU module	Q173CPUN/Q172CPUN/Q173CPU/Q172CPU Motion CPU module
MR-H-BN or Servo amplifier	Servo amplifier model MR-H□BN
MR-J2□-B or Servo amplifier	Servo amplifier model MR-J2S-□B/MR-J2M-B/MR-J2-□B/MR-J2-03B5
Q172LX/Q172EX/Q173PX or Motion module	Q172LX Servo external signals interface module/ Q172EX Serial absolute synchronous encoder interface module/ Q173PX Manual pulse generator interface module
QCPU, PLC CPU or PLC CPU module	Qn(H)CPU
Multiple CPU system or Motion system	General name for Multiple PLC system of the Q series
Programming S/W package	SW6RN-GSV□P and GX Developer software package
Manual pulse generator or MR-HDP01	General name for Manual pulse generator (MR-HDP01)
Serial absolute synchronous encoder or MR-HENC	General name for Serial absolute synchronous encoder (MR-HENC)
SSCNET (Note)	High speed synchronous communication network between Motion controller and servo amplifier.
Cooling fan unit	Cooling fan unit (Q170FAN)
Dividing unit	Dividing unit (Q173DV)
Battery unit	Battery unit (Q170BAT)
A□0BD-PCF	A10BD-PCF/A30BD-PCF SSC I/F board
Intelligent function module	General name for MELSECNET/H module/Ethernet module/CC-Link module/Serial communication module

(Note) SSCNET: Servo System Controller NETwork

REMARK

For information about the QCPU, peripheral devices for PLC program creation, I/O modules and intelligent function module, refer to the manual relevant to each module. Also, refer to the programming manual of the operating system for information about creating motion programs, and refer to the help of each software for information about operation of each programming software package.

MEMO

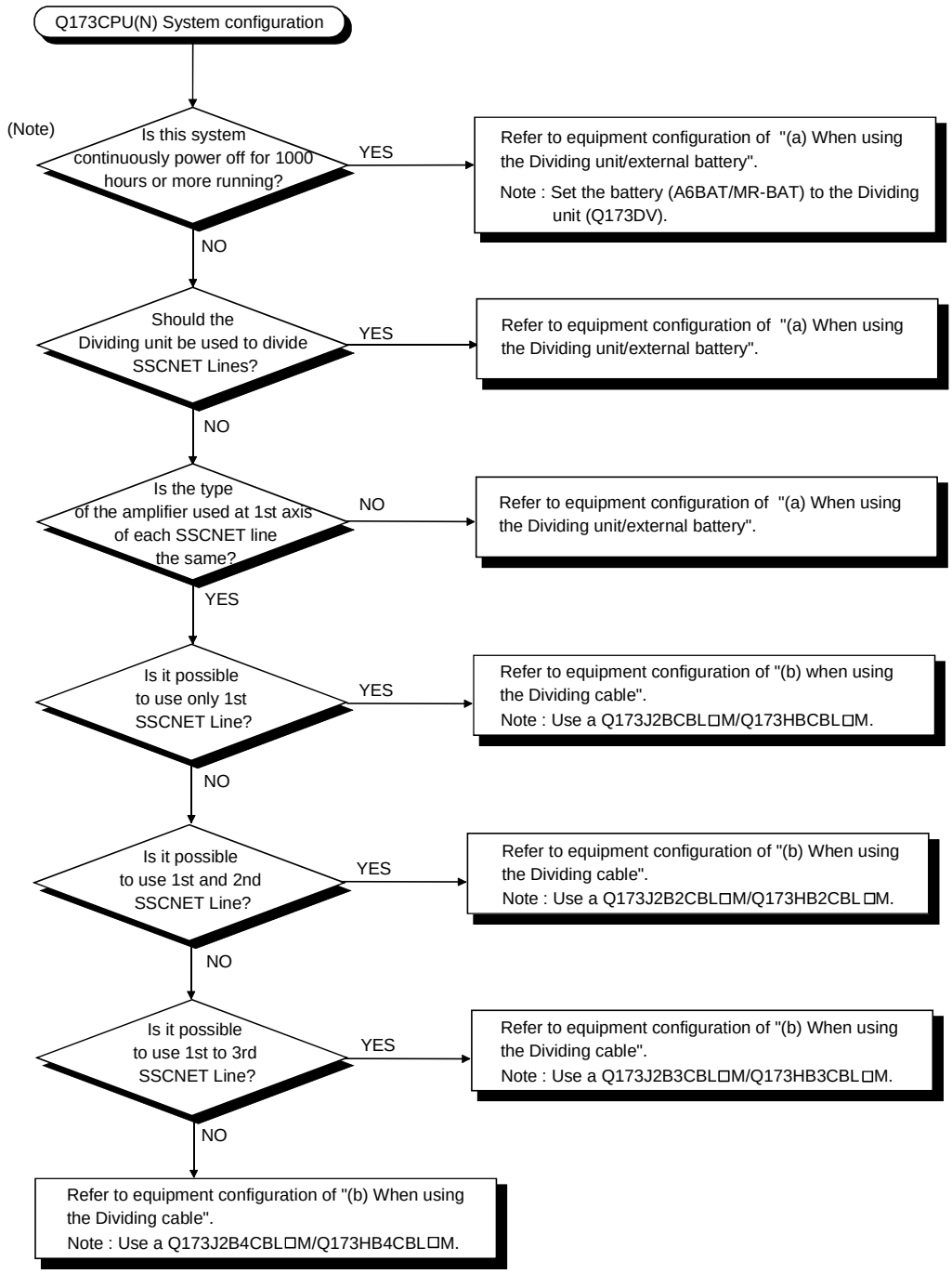
2. SYSTEM CONFIGURATION

This section describes the system configuration of the Q173CPU(N)/Q172CPU(N), cautions on use of the system, and configured equipment.

2.1 Motion System Configuration

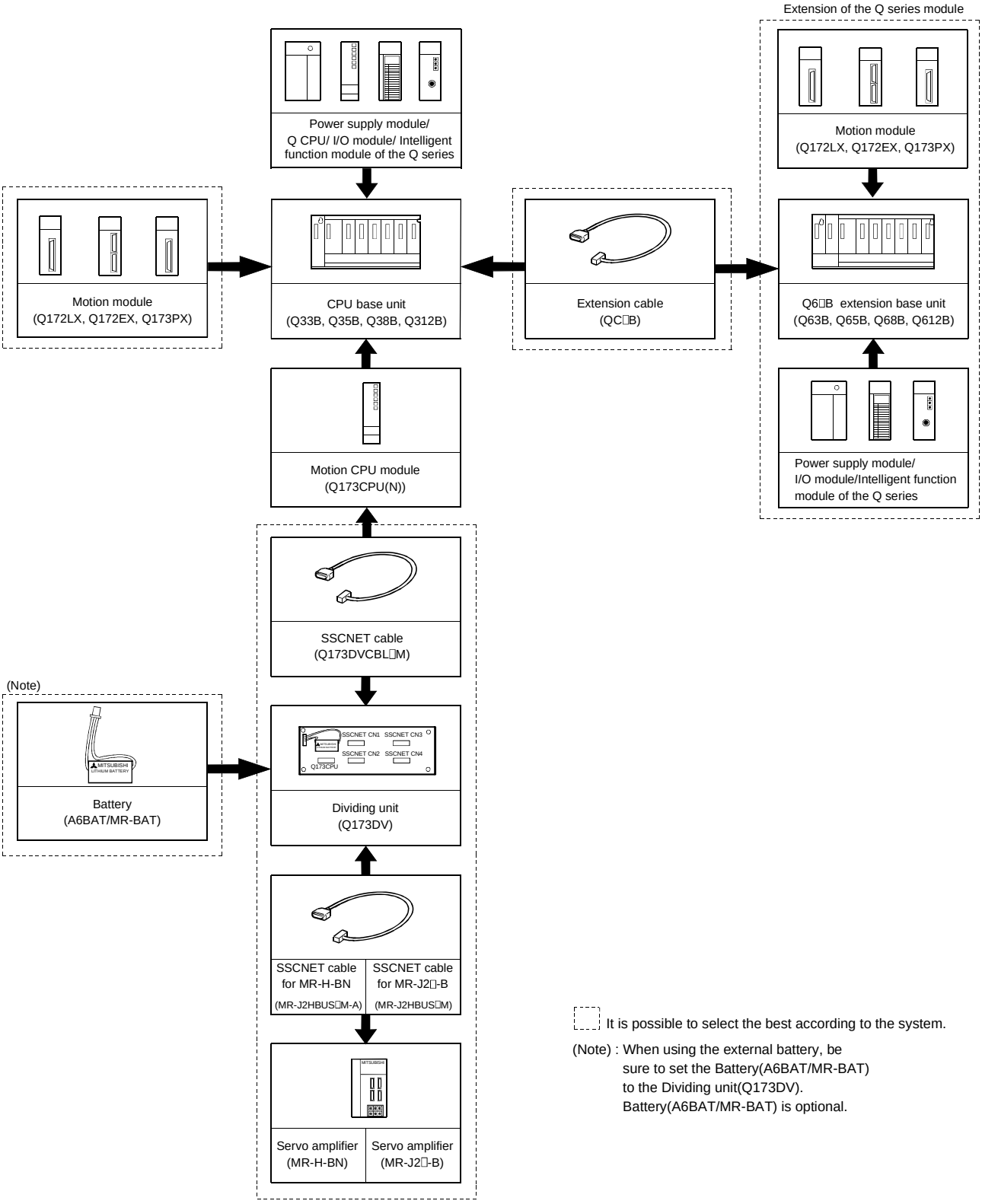
The outline of the equipment configuration, configuration with peripheral devices, and system configuration in the Q173CPU(N)/Q172CPU(N) system is described below.

(1) Equipment configuration in Q173CPU(N) system



(Note) : Continuous power failure time which can be backed up on the internal battery is different depending on the charge time. It is possible to continuously power off for 1100 hours because of charge of 40 hours. Refer to the section 2.3(5) for details.

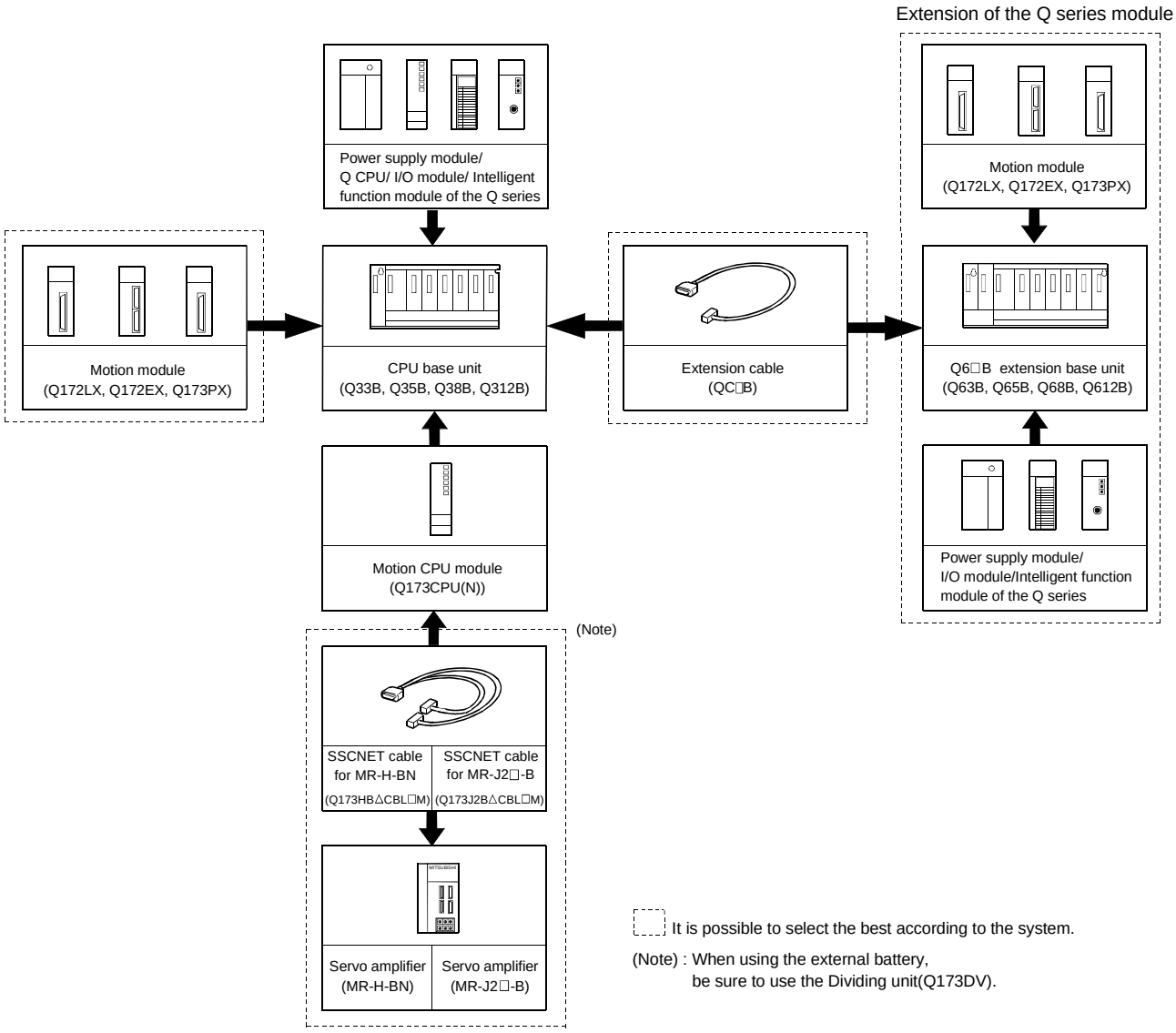
(a) When using the Dividing unit/external battery



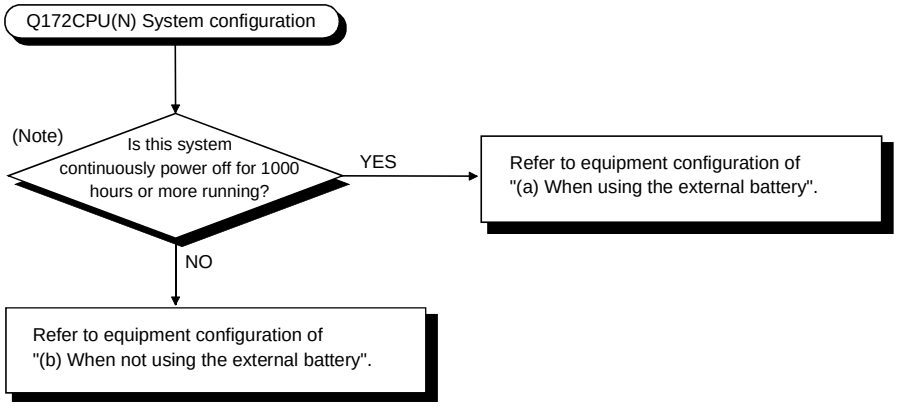
It is possible to select the best according to the system.

(Note) : When using the external battery, be sure to set the Battery(A6BAT/MR-BAT) to the Dividing unit(Q173DV). Battery(A6BAT/MR-BAT) is optional.

(b) When using the Dividing cable

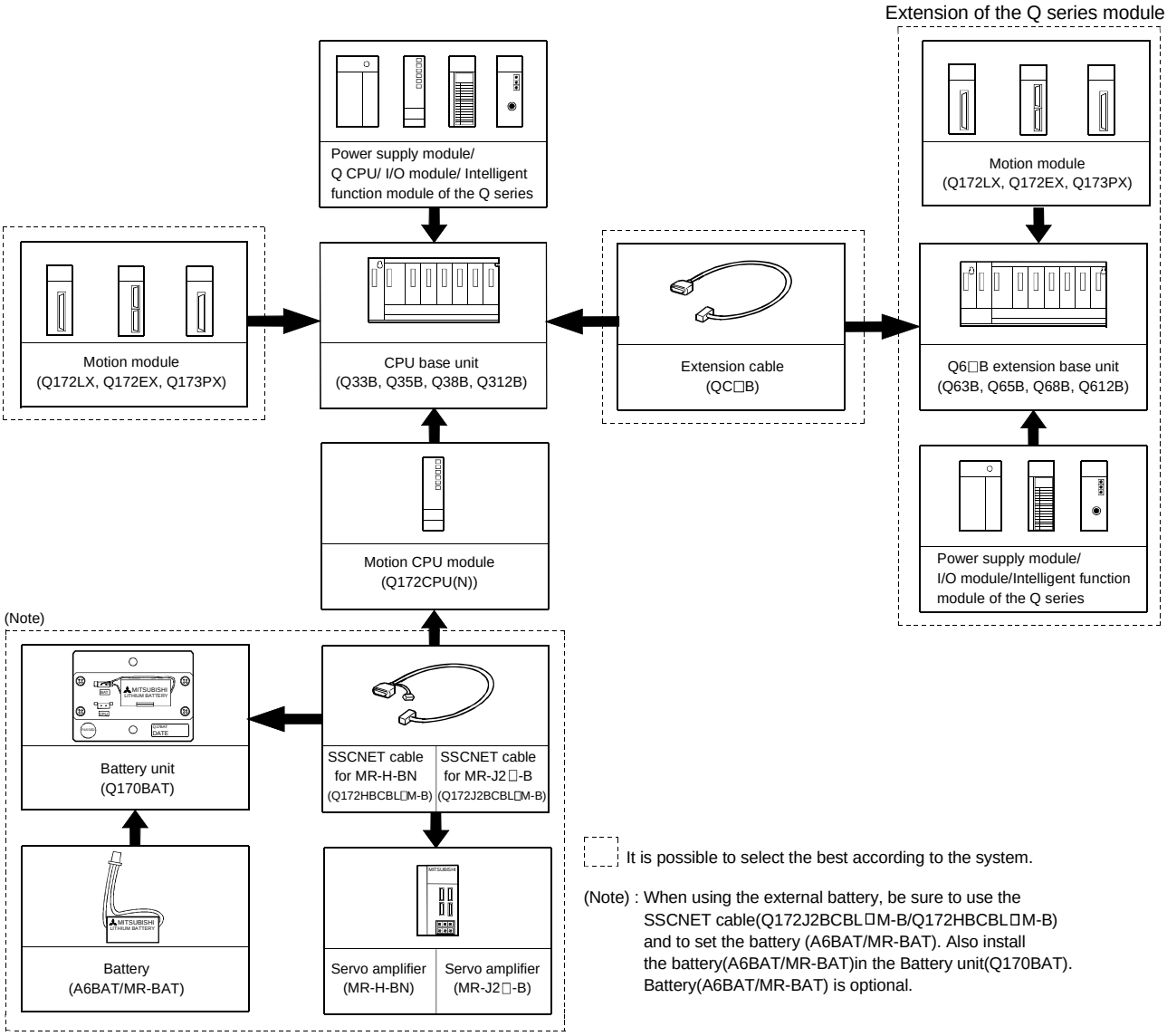


(2) Equipment configuration in Q172CPU(N) system

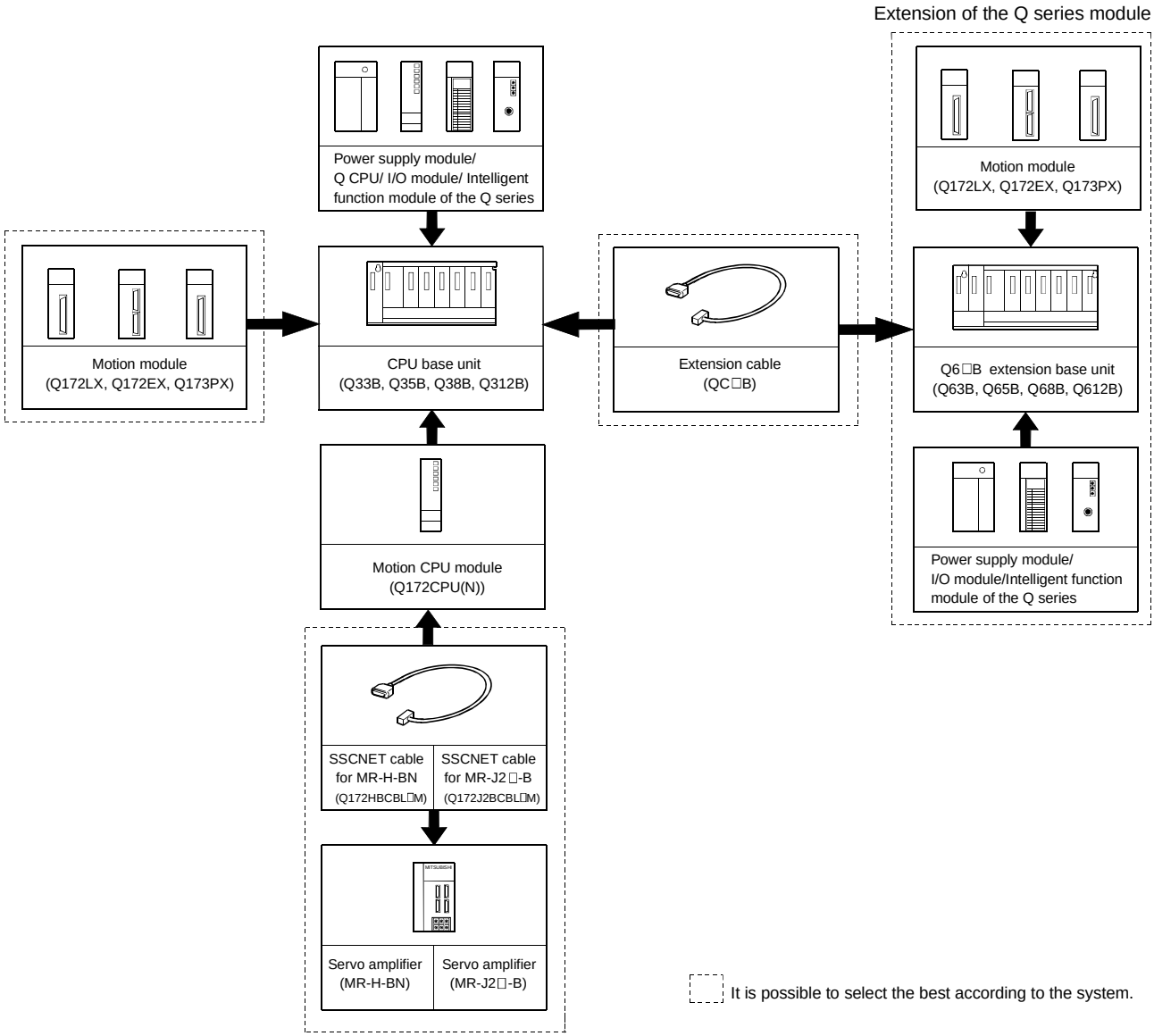


(Note) : Continuous power off time which can be backed up on the internal battery is different depending on the charge time. It is possible to continuously power off for 1100 hours because of charge of 40 hours. Refer to the section 2.3 (5) for details.

(a) When using the external battery

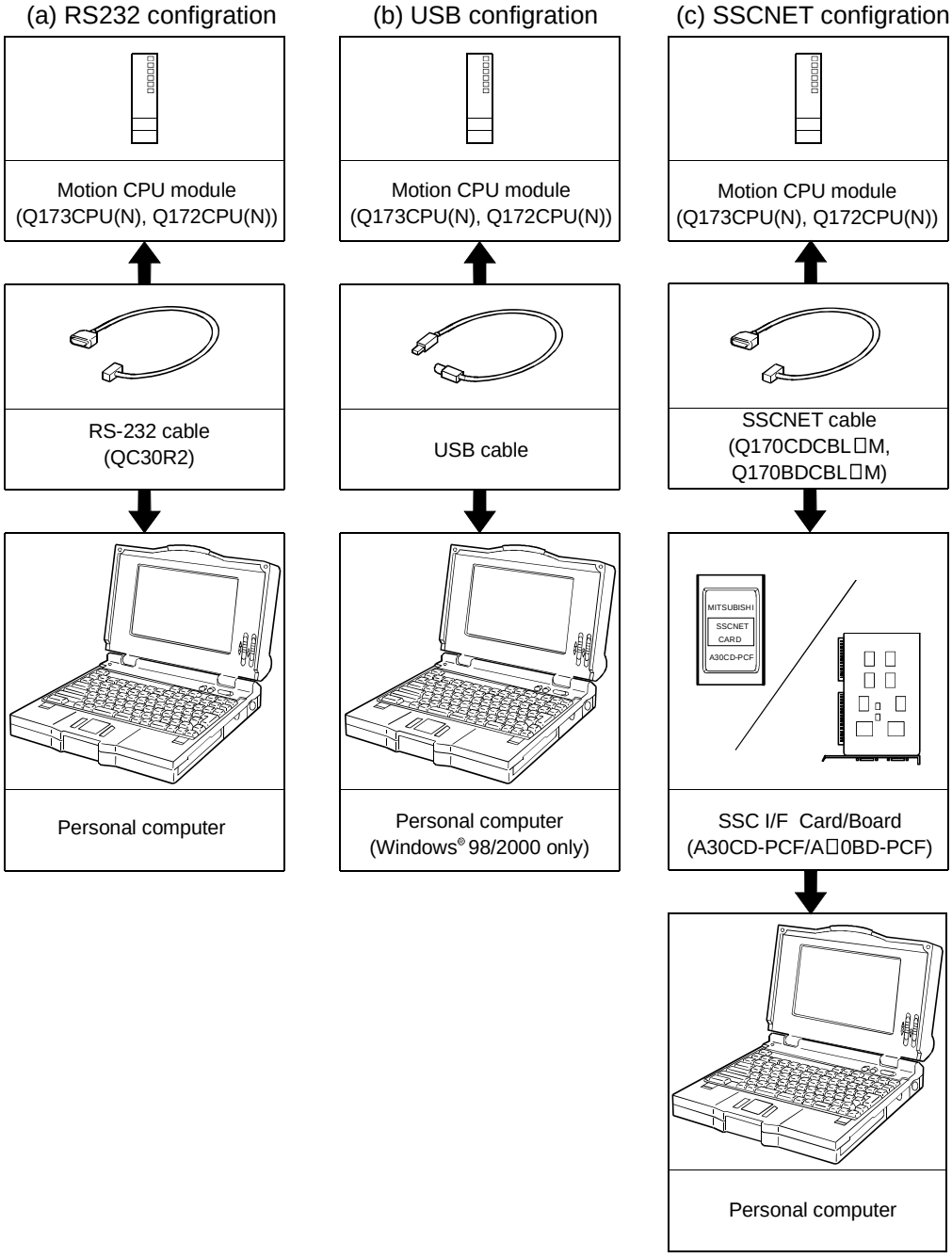


(b) When not using the external battery



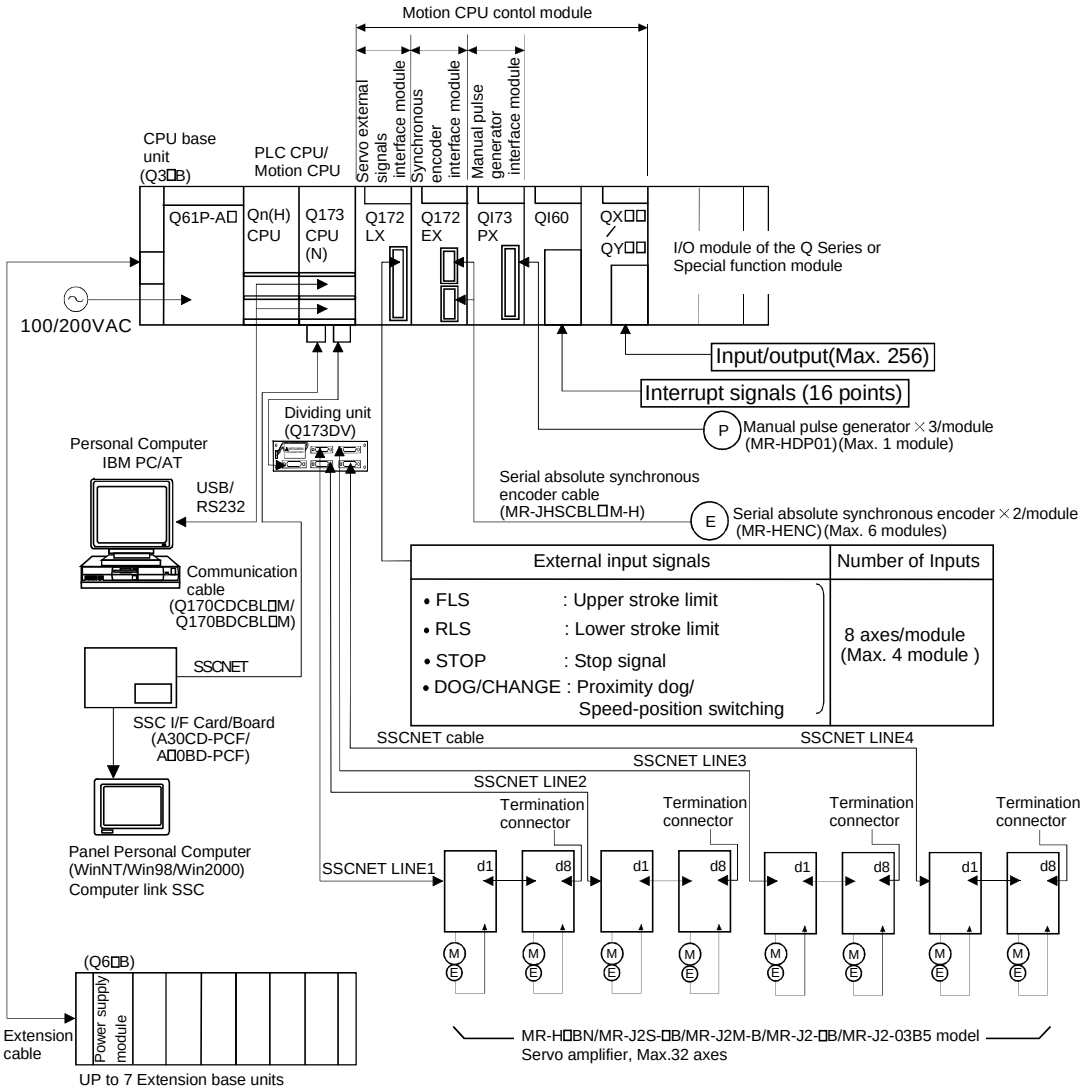
(3) Configuration of peripheral devices for the Q173CPU(N)/ Q172CPU(N)

The following (a) (b) (c) can be used.



(Note) : For information about GPP functions of QCPU, refer to the operating manual of PLC. Also, refer to the programming manual of the operating system for information about creating motion programs, and refer to the help of each software for information about operation of each programming software package.

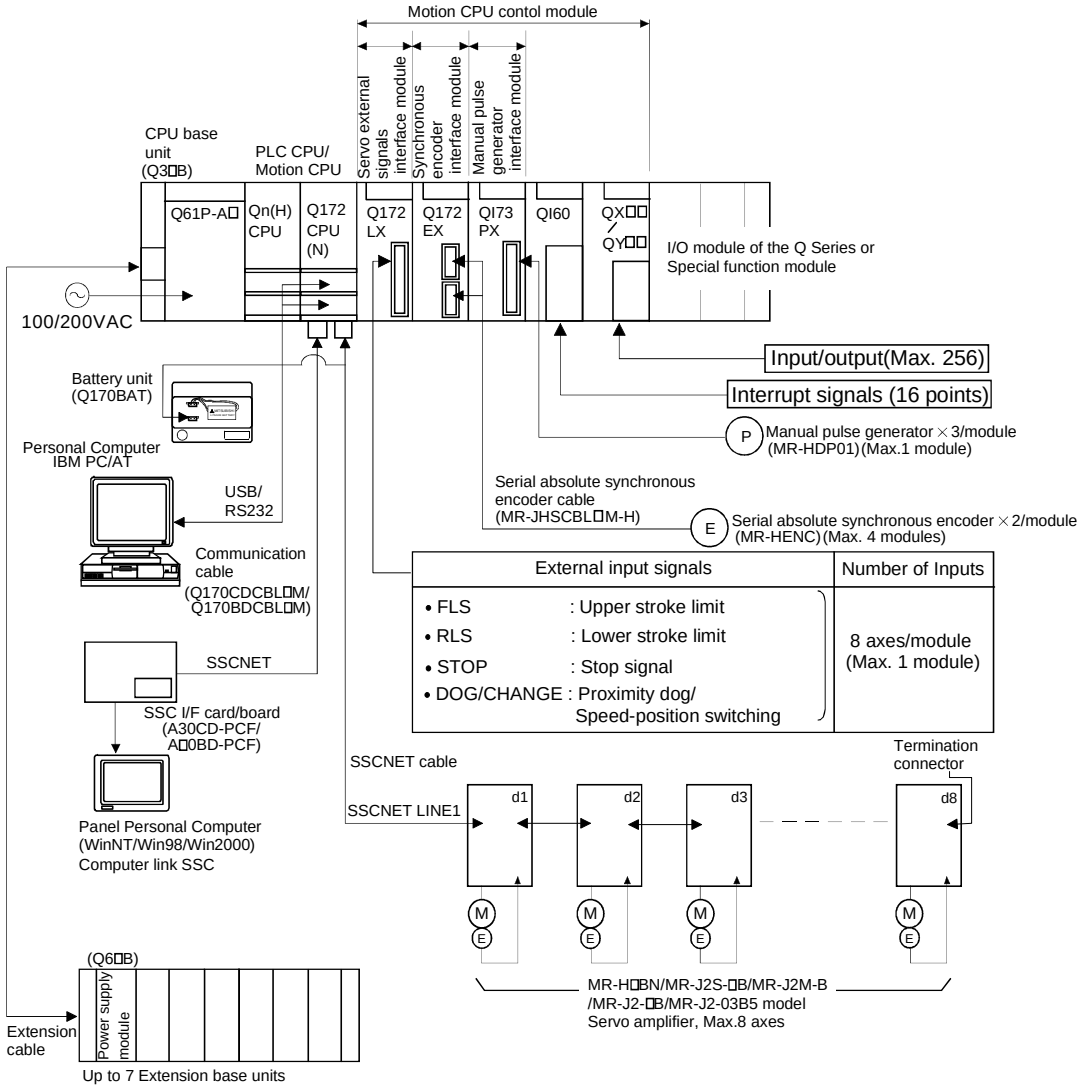
2.1.1 Q173CPU(N) System overall configuration



⚠ CAUTION

- Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.
- The ratings and characteristics of the parts (other than Motion controller, servo amplifier and servomotor) used in a system must be compatible with the Motion controller, servo amplifier and servomotor.
- Set the parameter values to those that are compatible with the Motion controller, servo amplifier, servomotor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.

2.1.2 Q172CPU(N) System overall configuration



⚠ CAUTION

- Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.
- The ratings and characteristics of the parts (other than Motion controller, servo amplifier and servomotor) used in a system must be compatible with the Motion controller, servo amplifier and servomotor.
- Set the parameter values to those that are compatible with the Motion controller, servo amplifier, servomotor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.

2.1.3 Function explanation of the Q173CPU(N)/Q172CPU(N) Motion CPU modules

(1) It is possible to download servo parameters to servo amplifier, turn the servo ON/OFF, and send the position commands by connecting the Motion CPU (Q173CPU(N)/Q172CPU(N)) and the servo amplifier with the SSCNET cable.

(2) It is possible to select the servo control functions/programming languages by installing the corresponding operating system software on the Q173CPU(N)/ Q172CPU(N).

(3) It is possible to use stroke limit signals connected to Q172LX and signals of serial encoders connected to Q172EX, etc. for the purpose of motion control by setting the Q173CPU(N)/Q172CPU(N) as the control CPU of various motion modules (Q172LX/Q172EX, etc.) .

(4) It is possible to perform not only servo control but also DI/O input/output control according to programs implemented in the Motion SFC program by setting the Q173CPU(N)/Q172CPU(N) as the control CPU of the Q series PLC I/O module (When using the Motion SFC as the operating system software).
(For information about the Q series PLC I/O modules that can be controlled by the Motion CPUs, refer to section 2.2 (2).)

(5) It is possible to exchange data such as automatic refresh among CPU as the Q series PLC multiple CPU system.

(6) There is no restriction on the positions at which the modules controlled by the Motion CPU (Q172LX/Q172EX, etc.) may be installed. Specify the installation position in the system settings.

2.1.4 Restrictions on motion systems

(1) It is not allowed to use the Motion CPU as the control CPU of a module installed on the QA1S6□B extension base unit. A PLC CPU must be used as the control CPU.

(2) The connector for installation of memory card on the Motion CPU module is for future function expansion.

(3) The Motion CPU module cannot be used as standalone module. It must always be used in combination with a PLC CPU (of a version that supports Multiple CPU systems). Moreover, it must be installed on the right side of the PLC CPU module. A PLC CPU cannot be installed in a position to the right of a Motion CPU.

(4) Use the PLC CPU in the “Q mode.”

(5) The Motion CPU cannot be set as the control CPU of the intelligent function module or the Graphic Operation Terminal (GOT).

(6) The SSCNET cable that connects the Motion CPU and the servo amplifiers can be pulled out from the lower part. Make sure to secure sufficient space for pulling out the cable when designing the board.

(7) The Motion CPU is one module element of the Q series multiple PLC system. It is necessary to set the parameters of the Q series multiple PLC system for each PLC CPU. The Motion CPU module must also be set to support the multiple system by system settings.

(8) Make sure to use the Motion CPU as the control CPU of motion modules dedicated for the Motion CPU (Q172LX, Q172EX, Q173PX, etc.). They will not operate correctly if a PLC CPU is set and installed as the control CPU by mistake. The Motion CPU is treated as a 32-point intelligent module by PLC CPUs of other machines.
It cannot be accessed from other machines.

(9) When a Multiple CPU system is configured, make sure to configure the modules so that the total current consumption of the individual modules on the CPU base does not exceed the 5VDC output capacity of the power supply module.
(Refer to section 2.4.2 (3), (4) Power supply module.)

(10) Number of Motion CPU modules and temperature conditions (Q173CPU/Q172CPU only)

(a) It is possible to remove the Cooling fan unit(Q170FAN) in order to disperse heat from inside the Motion CPU module according to the number of the Motion CPU module and ambient temperature conditions.
Removable/Not removable of the Cooling fan unit (Q170FAN) by number of Motion CPU modules and ambient temperature is as follows.

1) When using only one Motion CPU module
It is possible to remove the Cooling fan unit if the ambient temperature in which the Motion CPU module will be operating is 0 to 40°C (32 to 104°F).

2) When using two or more Motion CPU modules
Do not remove the Cooling fan unit(Q170FAN).

Ambient temperature of the Motion CPU / Number of the Motion CPU	0 to 40°C (32 to 104°F)	Over 40 to 55°C (Over 104 to 131°F)
1 module	Removable	Not removable
2 modules or more	Not removable	

(11) When the internal battery of the Motion CPU is charged for 40 hours of normal operation, it will be able to provide backup power for the IC-RAM memory for 1100 hours (Guaranteed time)/4300 hours (Actual time) .
Battery backup by the external battery will be necessary if there is a possibility that a continuous power off that lasts longer than the continuous power off hours for the internal battery. (Refer to section 2.4.9 External battery)

Item		Continuous power off time	
		Guaranteed time (MIN) [h]	Actual time (TYP) [h]
Internal rechargeable battery only	Charging time of 8 hours or more	200	500
	Charging time of 40 hours or more	1100	4300
External battery		60000	240000

2.2 System Configuration Equipment

(1) Table of motion module

Part name	Model name	Description	Current consumption 5VDC[A]	Remark
Motion CPU module	Q172CPUN	Max.8 axes control	1.14	
	Q172CPU	Max.8 axes control, with Cooling fan unit	1.62	
	Q173CPUN	Max.32 axes control	1.25	
	Q173CPU	Max.32 axes control, with Cooling fan unit	1.75	
Servo external signals interface module	Q172LX	Servo external signal 8 axes (FLS, RLS, STOP, DOG/CHANGE×8)	0.05	
Serial absolute synchronous encoder interface module	Q172EX	Serial absolute synchronous MR-HENC interface×2 Tracking input 2 points	0.07	
Manual pulse generator interface module	Q173PX	Manual pulse generator MR-HDP01/ Synchronous encoder interface ×3, Tracking input 3 points	0.11	
PLC CPU module	Q02CPU	Program capacity 28k	0.60	
	Q02HCPU	Program capacity 28k	0.64	
	Q06HCPU	Program capacity 60k	0.64	
	Q12HCPU	Program capacity 124k	0.64	
	Q25HCPU	Program capacity 252k	0.64	
Power supply module	Q61P-A1	100 to 120VAC input/ 5VDC 6A output	——	
	Q61P-A2	200 to 240VAC input/ 5VDC 6A output	——	
	Q63P	24VDC Input/ 5VDC 6A output	——	
	Q64P	100 to 120VAC/200 to 240VAC Input/ 5VDC 8.5A output	——	
CPU base unit	Q33B	Number of I/O modules installed 3 slots	0.105	
	Q35B	Number of I/O modules installed 5 slots	0.110	
	Q38B	Number of I/O modules installed 8 slots	0.114	
	Q312B	Number of I/O modules installed 12 slots	0.121	
Extension base unit	Q63B	Number of I/O modules installed 3 slots	0.105	
	Q65B	Number of I/O modules installed 5 slots	0.110	
	Q68B	Number of I/O modules installed 8 slots	0.114	
	Q612B	Number of I/O modules installed 12 slots	0.121	
Extension cable	QC05B	Length 0.45m(1.48ft.)	——	
	QC06B	Length 0.6m(1.97ft.)		
	QC12B	Length 1.2m(3.9ft.)		
	QC30B	Length 3m(9.8ft.)		
	QC50B	Length 5m(16.4ft.)		
	QC100B	Length 10m(32.8ft.)		
Manual pulse generator	MR-HDP01	Pulse resolution: 25PLS/rev(100PLS/rev after magnification by 4) Permitted axial loads Radial load: Max.19.6N Thrust load: Max. 9.8N Permitted speed: 200r/min(Normal rotation)	0.06	
Serial absolute synchronous encoder	MR-HENC	Resolution: 16384PLS/rev Permitted axial loads Radial load: Max.98N Thrust load: Max.49N Permitted speed: 4300r/min	0.15	

Table of motion module(continued)

Part name	Model name	Description	Current consumption 5VDC[A]	Remark
Serial absolute synchronous encoder cable	MR-JHSCBL□M-H	Connection between Serial absolute synchronous encoder and Q172EX 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.) (Same as encoder cables for HC-SFS/RFS/UFS(2000r/min) series motors)	——	
SSCNET cable	Q170BDCBL□M	Connection between Q173CPU(N)/Q172CPU(N) and SSC I/F board 3m(9.84ft.), 5m(16.4ft.), 10m(32.8ft.)	——	
	Q170CDCBL□M	Connection between Q173CPU(N)/Q172CPU(N) and SSC I/F card 3m(9.84ft.), 5m(16.4ft.), 10m(32.8ft.)		
	Q172J2BCBL□M	Connection between Q172CPU(N) and Battery unit (Q170BAT), Q172CPU(N) and servo amplifier (MR-J2S-□B/MR-J2M-B/ MR-J2-□B/MR-J2-03B5) 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	——	Battery unit needs to use "-B" type cable.
	Q172J2BCBL□M-B			
	Q172HBCBL□M	Connection between Q172CPU(N) and Battery unit (Q170BAT), Q172CPU(N) and servo amplifier (MR-H□BN) 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)		
	Q172HBCBL□M-B			
	Q173J2B△CBL□M	Connection between Q173CPU(N) and servo amplifier (MR-J2S-□B/MR-J2M-B/MR-J2-□B/MR-J2-03B5) 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	——	
	Q173HB△CBL□M	Connection between Q173CPU(N) and servo amplifier (MR-H□BN) 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)		
	Q173DVCBL□M	Connection between Q173CPU(N) and Q173DV 0.5m(1.64ft.), 1m(3.28ft.)		
SSC I/F board	A10BD-PCF	PCI bus loading type, 2 ch/board	——	
	A30BD-PCF	ISA bus loading type, 2 ch/board		
SSC I/F card	A30CD-PCF	PCMCIA TYPE II, 1 ch/card		
Dividing unit	Q173DV	For dividing the SSCNET lines of Q173CPU(N) into 4. (Attachment: Battery holder for IC-RAM memory backup)	——	
Battery unit	Q170BAT	For IC-RAM memory backup of Q172CPU(N)	——	
Battery	A6BAT	For IC-RAM memory backup of Q173CPU(N)/Q172CPU(N) module (SFC programs, Servo programs, Parameters)	——	
Cooling fan unit	Q170FAN	Cooling fan of the Motion CPU module	0.08	
Q172CPU(N) connector set	Q172CON	Connector for Q172CPU(N) (Note-1) Connector : HDR-E14MG1 Case : HDR-E14LPA5	——	
Q173CPU(N) connector set	Q173CON	Q173CPU(N) side connector set (Note-1) Connector : HDR-E26MG1 Case : HDR-E26LPA5	——	

Table of motion module(continued)

Part name	Model name	Description	Current consumption 5VDC[A]	Remark
Q173DV connector set	Q173DVCON	Q173CPU(N) side connector set (Note-1) Connector : HDR-E26MG1 Case : HDR-E26LPA5 Q173DV side connector set Connector : 10126-3000VE Case : 10326-52F0-008	——	

△=Number of lines (none: 1 Line, 2: 2 Lines, 3: 3 Lines, 4: 4 Lines)

□=Cable length (0.5: 0.5m(1.64ft.), 1: 1m(3.28ft.), 2: 2m(6.56ft.), 3: 3m(9.84ft.), 4: 4m(13.12ft.), 5: 5m(16.4ft.))

(Note-1) : Crimping terminal is not sold in Mitsubishi. The following terminal is requested to be procured by customers.
Specified tool (Honda Connectors make) : FHAT-0029/FHPT-0004C

(2) Q series PLC module which can be control by Motion CPU

Part name			Model name	Description	Remark
Input module	AC		QX10	100-120VAC, 7-8mA, 16 points, Terminal block	
	DC		QX40	24VDC/4mA, Positive common, 16 points, Terminal block	
			QX41	24VDC/4mA, Positive common, 32 points, Connector	✻
			QX42	24VDC/4mA, Positive common, 64 points, Connector	✻
			QX70	12VDC/5V, Positive common/Negative common shared, 16 points, Terminal block	
			QX71	12VDC/5V, Positive common/Negative common shared, 32 points, Terminal block	
			QX72	12VDC/5V, Positive common/Negative common shared, 64 points, Terminal block	
			QX80	24VDC/4mA, Negative common, 16 points, Terminal block	
			QX81	24VDC/4mA, Negative common, 32 points, Connector	✻
Output module	Contact output module		QY10	240VAC/24VDC, 2A/point, 8A/common, 16 points/common, Terminal block	
	Transistor	Sink Type	QY40P	12V/24VDC, 0.1A/point, 1.6A/common, 16 points/common Terminal block	
			QY41P	12V/24VDC, 0.1A/point, 2A/common, 32 points/common Connector	✻
			QY42P	12V/24VDC, 0.1A/point, 2A/common, 64 points(32 points/common), Connector	✻
			QY50	12V/24VDC, 0.5A/point, 4A/common, 16 points(16 points/common), Terminal block	
		Source Type	QY80	12V/24VDC, 0.5A/point, 4A/common, 64 points(32 points/common), Terminal block	
			QY81P	12V/24VDC, 0.1A/point, 2A/common, 32 points(32 points/common), Connector	✻
	TTL•CMOS(Sink)		QY70	5/12VDC, 16mA/point, 16 points(16 points/common), Terminal block	
			QY71	5/12VDC, 16mA/point, 32 points(32 points/common), Connector	✻
Input/Output composite module	DC Input/ Transistor output		QH42P	24VDC Positive common: 32 points DC12-24V/0.1A Output Sink type: 32 points, Connector, Provided (Thermal protectors, protector against short circuit)	✻
			QX48Y57	24VDC Positive common: 8 points DC12-24V/0.5A Output Sink type: 7 points, Terminal block, Provided (When face is broken, LED lights and signal is output to CPU)	
Interrupt module			QI60	DC24V/4mA, Positive common, 16 points, Terminal block	

Marked "✻" connectors are not provided.

(3) Table of servo amplifier

The following servo amplifier series can be used.

(a) MR-H□BN

Part name	Model name	Description
MR-H series servo amplifier	MR-H□BN	Refer to catalogue of the servo amplifier about the output capacity of the servomotor.
	MR-H□□KBN	
Battery	MR-BAT	Back-up for the absolute position detection.
Termination connector	MR-TM	Connected to the last servo amplifier (MR-H□BN) by SSCNET.
Regenerative resistor	MR-RB□	Refer to catalogue of the servo amplifier about the regenerative resistance.
	MR-H□	
	MR-RB□-4	
SSCNET cable	MR-HBUS□M	Connection between MR-H□BN and MR-H□BN 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
Encoder cable	MR-HSCBL□M	Connection between HA-LH□K, HC-SF/RF/UF(2000r/min) series motor and MR-H□BN. 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.)
	MR-EN1CBL□M-H	
	MR-JCCBL□M-L	Connection between HA-FF, HC-MF/UF(3000r/min) and MR-H□BN
	MR-JCCBL□M-H	
Encoder connector set	MR-JSCNS	Servo amplifier side connector for HA-LH□K, HC-SF/RF/UF(2000r/min) series motor, Encoder side connector set
	MR-EN1CNS	

(b) MR-J2S-□B/MR-J2M-B/MR-J2-□B/MR-J2-03B5

Part name	Model name	Description	
MR-J2-Super series servo amplifier	MR-J2S-□B	Refer to catalogue of the servo amplifier about the output capacity of the servomotor.	
	MR-J2S-□B1		
MR-J2M series servo amplifier	MR-J2M-□DU	Drive unit	Refer to catalogue of the servo amplifier about the output capacity of the servomotor.
	MR-J2M-P8B	Interface unit	
	MR-J2M-BU□	Base unit	
MR-J2 series servo amplifier	MR-J2-□B	Refer to catalogue of the servo amplifier about the output capacity of the servomotor.	
MR-J2-Jr series servo amplifier	MR-J2-03B5		
Battery	MR-BAT	Back-up for the absolute position detection.	
Termination connector	MR-A-TM	Connected to the last servo amplifier(MR-J2S-□B/MR-J2M-B/MR-J2-□B/MR-J2-03B5) by SSCNET	
SSCNET cable	MR-J2HBUS□M-A	Connection between Q173DV and MR-H□BN. Connection between MR-H□BN and (MR-J2S-□B/MR-J2M-B/MR-J2-□B/ MR-J2-03B5). 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	
	MR-J2HBUS□M	Connection between Q173DV and (MR-J2S-□B/MR-J2M-B/MR-J2-□B/MR-J2-03B5). Connection between (MR-J2S-□B/MR-J2M-B/MR-J2-□B/MR-J2-03B5) and (MR-J2S-□B/MR-J2M-B/MR-J2-□B/MR-J2-03B5). 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)	
Encoder cable	MR-JHSCBL□M-L	Standard cable	Connection between HC-SFS/RFS/UFS(2000r/min) series motor and MR-J2S-□B/MR-J2M-B. Connection between HC-SF/RF/UF(2000r/min) series motor and MR-J2-□B. 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.)
	MR-JHSCBL□M-H	Long fixing life encoder cable	
	MR-ENCBL□M-H		
	MR-JCCBL□M-L	Standard cable	Connection between HC-MFS/KFS/UFS(3000r/min) series motor and MR-J2S-□B/MR-J2M-B. Connection between HC-MF/UF(3000r/min) and HA-FF series motor and MR-J2-□B. 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.)
	MR-JCCBL□M-H	Long fixing life encoder cable	
	MR-JCCBL□M-H		Connection between HC-AQ series motor and MR-J2-03B5. 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.)
	MR-JRBRCBL□M-H		Connection between HC-AQ series motor and MR-J2-03B5. 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.) (Motor cable for servomotor with electro magnetic brake)
Encoder connector set	MR-J2CNS	Servo amplifier and junction side connector set for HC-SFS/RFS/UFS(2000r/min) series motor, HC-SF/RF/UF(2000r/min) series motor.	
	MR-ENCNS		
	MR-JRCNM	Servo amplifier and Junction connector set for HC-AQ series motor.	
	MR-JRBRCNM	Servo amplifier side(Motor cable for servomotor with electro magnetic brake) and HC-AQ series motor. (Need MR-JRBRCN for electromagnetic brake contact)	
	MR-JRBRCN	Electromagnetic brake contact connector for HC-AQ series motor.	
	MR-J2CNM	Servo amplifier and junction side connector set for HC-MFS/KFS/UFS(3000r/min) series and HA-FF, HC-MF/UF(3000r/min) series motor.	

(4) Software packages

(a) OS software packages

Application	OS software package		Remark
	Q173CPU(N)	Q172CPU(N)	
For conveyor assembly **SV13** (Motion SFC)	SW6RN-SV13QB	SW6RN-SV13QD	
For automatic machinery **SV22** (Motion SFC)	SW6RN-SV22QA	SW6RN-SV22QC	

(b) Integrated start-up support software packages

Model name	Details		Remark
SW6RN-GSVPROE	SW6RNC-GSVE (Integrated start-up support software (1 CD-ROM))	Conveyor assembly software : SW6RN-GSV13P Automatic machinery software : SW6RN-GSV22P Cam data creation software : SW3RN-CAMP Digital oscilloscope software : SW6RN-DOSCP Communication system software : SW6RN-SNETP Document print software : SW3RN-DOCPRNP, SW20RN-DOCPRNP	
	SW6RNC-GSVHELPE(Operation manual(1 CD-ROM))		
	Installation manual		
SW6RNC-GSVSETE	SW6RNC-GSVPROE		
	A30CD-PCF(SSC I/F card(PCMCIA TYPE II 1CH/card))		
	Q170CDCBL3M(A30CD-PCF cable 3m(9.84ft.))		

(Note) : Operating environment of the programming software is WindowsNT® 4.0/ Windows® 98/Windows® 2000 English version) only.

(c) PLC software packages

Model name	PLC software package	Remark
GX Developer	SW□D5C-GPPW-E	

(Note) : □=used "6" or later.

(5) Operating environment of the personal computer

Operating environment is as follows.

IBM PC/AT with which WindowsNT4.0/98/2000 English version operates normally.

Item	WindowsNT® 4.0(Service Pack 2 or later) (Note) or Windows® 98	Windows® 2000
CPU	Pentium133MHz or more	Pentium II 233MHz or more
Memory capacity	Recommended 32MB or more	Recommended 64MB or more
Hard disk free space	Hard disk free space is as following list.	
Disk drive	3.5inch (1.44MB) floppy disk drive, CD-ROM disk drive	
Display	800×600 pixels, 256 colors or more	

(Note) : Impossible to use USB connection.

It is necessary the following capacity depending on the installed software.

● SW6RNC-GSVE

Model name	Size	
SW6RN-GSV13P	15MB	
SW6RN-GSV22P	15MB	
SW3RN-CAMP	1MB	
SW6RN-DOSCP	3MB	
SW6RN-SNETP	Standard	1.5MB
	Custom (When all selection)	2MB
SW3RN-DOCPRNP, SW20RN-DOCPRNP	7MB	

● SW6RNC-GSVHELPE

Model name	Size
SW6RN-GSV13P	23MB
SW6RN-GSV22P	30MB
SW3RN-CAMP	2MB
SW6RN-DOSCP	2MB
SW6RN-SNETP	1MB
SW3RN-DOCPRNP, SW20RN-DOCPRNP	2MB

(Note-1) : Pentium ® are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

(Note-2) : WindowsNT® , Windows® are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

POINT

(1) When the operation of Windows is not unclear in the operation of this software, refer to the manual of Windows or guide-book from the other supplier.

(2) The screen might not be correctly displayed depending on the system font size of WindowsNT® 4.0/Windows® 98/Windows® 2000. Be sure to use the small size fonts.

2.3 General Specifications

General specifications of Q173CPU(N)/Q172CPU(N) module is as follows.

Item	Specification					
Operating ambient temperature	0 to 55°C (32 to 131°F)					
Storage ambient temperature	-25 to 75°C (Note-3) (-13 to 167°F)					
Operating ambient humidity	5 to 95% RH, non-condensing					
Storage ambient humidity	5 to 95% RH, non-condensing					
Vibration resistance	Conforming JIS B 3501, IEC 61131-2		Frequency	Acceleration	Amplitude	Sweep count
		Under intermittent vibration	10 to 57Hz	——	0.075mm (0.003inch)	10 times each in X, Y, Z directions (For 80 min.)
			57 to 150Hz	9.8m/s^2	——	
		Under continuous vibration	10 to 57Hz	——	0.035mm (0.001inch)	
			57 to 150Hz	4.9m/s^2	——	
Shock resistance	Conforming to JIS B 3501, IEC 61131-2(147m/s^2, 3 times in each of 3 directions X, Y, Z)					
Operating ambience	No corrosive gases					
Operating altitude	2000m(6562ft.) or less					
Installation location	Inside control panel					
Overvoltage category (Note-1)	II or less					
Pollution level (Note-2)	2 or less					

(Note-1) : This indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within premises.
Category II applies to equipment for which electrical power is supplied from fixed facilities.
The surge voltage withstand level for up to the rated voltage of 300V is 2500V.

(Note-2) : This index indicates the degree to which conductive material is generated in terms of the environment in which the equipment is used.
Pollution level 2 is when only non-conductive pollution occurs. A temporary conductivity caused by condensing must be expected occasionally.

(Note-3) : Do not use or store the Motion CPU module under pressure higher than the atmospheric pressure of altitude 0m. Doing so can cause a malfunction. When using the PLC under pressure, please contact your sales representative.

⚠ CAUTION

- The Motion controller must be stored and used under the conditions listed in the table of specifications above.
- When not using the module for a long time, disconnect the power line from the Motion controller or servo amplifier.
- Place the Motion controller and servo amplifier in static electricity preventing vinyl bags and store.
- When storing for a long time, please contact with our sales representative.

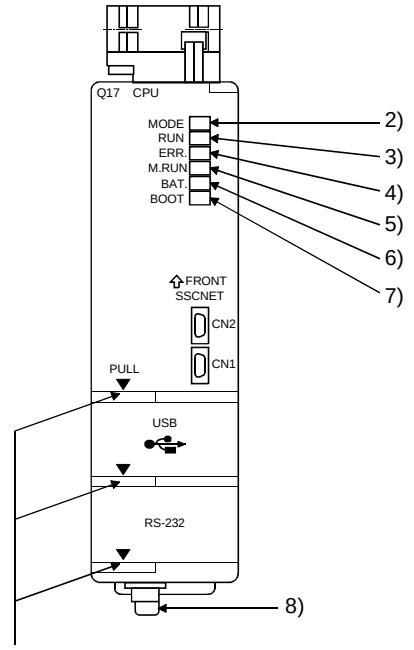
2.4 Specifications of Equipment and Settings

2.4.1 Q173CPU(N)/Q172CPU(N)

(1) Q173CPU(N)/Q172CPU(N) Name of parts

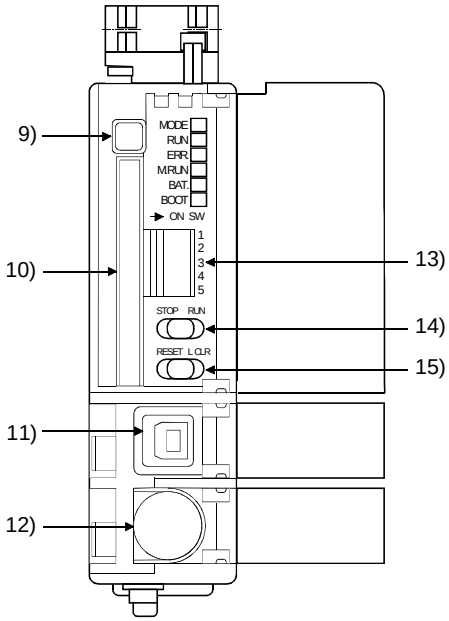
This section explains the names and setting of the module.

Front face

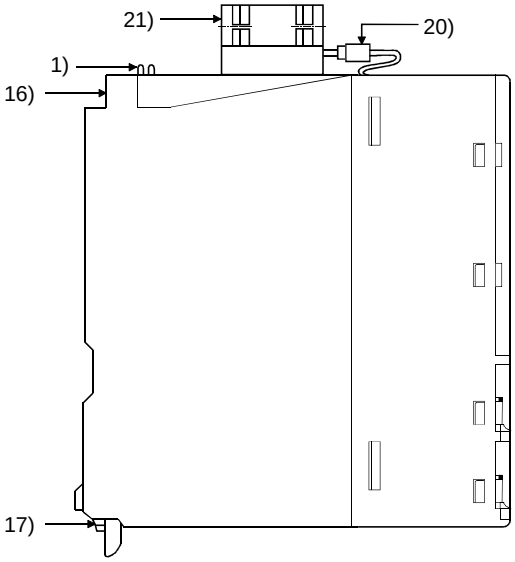


When opening the cover, put your finger here.

With Front cover open

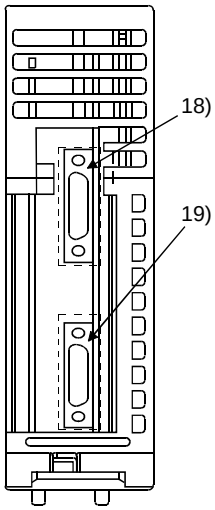


Side face

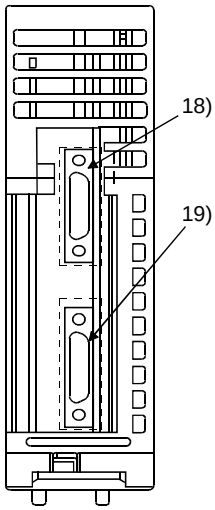


Bottom

Q172CPU

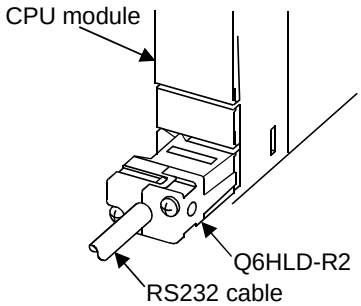


Q173CPU

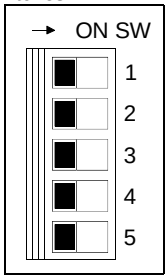


No.	Name	Application
1)	Module fixing hook	Hook used to fix the module to the base unit.(Quick release installation)
2)	MODE LED (Mode judging)	Lit(green) : Normal mode Lit(orange) : Installation • ROM writing mode
3)	RUN LED	Lit : Motion CPU normal start Not lit : Motion CPU fault. RUN LED turn off when the trouble occurred at starting or WDT error occurred.
4)	ERR. LED	Lit : When error occurs, LED turn on as follows 1) WDT error 2) System setting error 3) Servo error 4) Motion SFC error 5) Detection of self diagnostic error which will not stop the operation(except for battery error). Flashing : Detection of self diagnostic error which will stop the operation. Not lit : Normal
5)	MOTION RUN LED	Lit : When motion control is executed. Flashing : When latch clear started. Not lit : When motion control is not executed, or when the self diagnostic error which will stop the operation was detected.
6)	BAT. LED	Lit : When the battery error occurred. (When using the external battery.)
7)	BOOT LED	Lit : ROM operating mode Not lit : ROM operating mode/Installation • ROM writing mode
8)	Module loading lever	Used to install the module to the base unit.
9)	Memory card EJECT button	Used to eject the memory card from the Motion CPU.
10)	Memory card loading connector	Connector used to connect the memory card to the Motion CPU. (The Motion CPU make use of the memory card by software package.)
11)	USB connector (Note)	Connector for connection with USB-compatible peripheral device. (Connector type B) Can be connected by USB-dedicated cable.
12)	RS-232 connector (Note)	Connector for connection with a peripheral device. Can be connected by RS-232 connection cable (QC30R2)

(Note) : When normally connecting a cable to the USB or RS232 connector, clamp the cable to prevent it from coming off due to the dangling, moving or careless pulling of the cable. Q6HLD-R2 type RS-232C connector disconnection prevention holder is available as a clamp for RS232 connector.



(2) Applications of switches, connectors on Q173CPU(N)/ Q172CPU(N)

<table>
<tr><th>No.</th><th>Name</th><th colspan="2">Application</th></tr>
<tr><td rowspan="5">13)</td><td rowspan="5">Dip switches
 
</td><td>Dip switch 1</td><td>Must not be used. Normally OFF. (Shipped from the factory in OFF position)</td></tr>
<tr><td>Dip switch 2
Dip switch 3</td><td>•ROM operating setting (Shipped from the factory in OFF position)
SW2 SW3
OFF OFF → RAM operating mode
ON OFF → Must not be set
OFF ON → Must not be set
ON ON → ROM operating mode</td></tr>
<tr><td>Dip switch 4</td><td>Must not be used. Normally OFF. (Shipped from the factory in OFF position)</td></tr>
<tr><td>Dip switch 5 (Installation • ROM writing switch)</td><td>ON : Installation • ROM writing mode
OFF : Normal mode (RAM operating mode/ROM operating mode)
Turn ON dip switch 5 when installed the operating system (OS) into the Motion CPU module from the peripheral device. After completing the installation, move to switch and re-start.</td></tr>
<tr><td>14)</td><td>RUN/STOP switch (Momentary switch)</td><td colspan="2">Move to RUN/STOP.
RUN : Executes Motion program.
STOP : Stops Motion program.</td></tr>
<tr><td>15)</td><td>RESET/L.CLR switch (Note-1) (Momentary switch)</td><td colspan="2">RESET : Set the switch to the “RESET” position once, and reset the hardware. Applies a reset after an operation error and initialized the operation.
L.CLR : Clear the latch area all data which set with the parameters.
(LATCH CLEAR also clears data outside the latch area at this time.)
Latch clear operating method
1) Set the “RUN/STOP” switch to “STOP”.
2) Move the “RESET/L.CLR” switch to “L.CLR” several times until the “MOTION RUN LED” flashing.
(“MOTION RUN LED” flashing : Latch clear completed.)
3) Move the “RESET/L.CLR” switch to “L.CLR” once more. (“MOTION RUN LED” turn off.)</td></tr>
<tr><td>16)</td><td>Module fixing screw hole</td><td colspan="2">Hole for the screw used to fix to the base unit. (M3×12 screw : Purchase from the other supplier)</td></tr>
<tr><td>17)</td><td>Module fixing hook</td><td colspan="2">Hook used to fix to the base unit.</td></tr>
<tr><td>18)</td><td>CN2 connector</td><td colspan="2">Connector for connection a personal computer and SSCNET.</td></tr>
<tr><td>19)</td><td>CN1 connector (Note-2)</td><td colspan="2">Connector for connection of the Motion CPU module and servo amplifier.</td></tr>
<tr><td>20)</td><td>Cooling fan connector (Note-3)</td><td colspan="2">Connector for connection of the Motion CPU module and the Cooling fan unit (Q170 FAN).</td></tr>
<tr><td>21)</td><td>Cooling fan unit (Note-3)</td><td colspan="2">The Cooling fan unit(Q170 FAN) designed exclusively for Motion CPU module.</td></tr>
</table>

(Note-1) : It is not possible to reset the Multiple CPU system by each of the QCPU/the Motion CPU No.2 to 4.
If it is reset, other CPU occurred to stop of the overall Multiple CPU system where “MULTI CPU DOWN (Error code : 7000).
The overall Multiple CPU system reset is resetting the CPU No.1 of the QCPU.

(Note-2) : For example of the Q173CPU(N), the connector CN1 divide signals allocated each of SSCNET LINE 1 to 4.
The Dividing unit (Q173DV) or the Dividing cable (Q173J2B△CBL□M/Q173HB△CBL□M) between the Motion CPU and servo amplifiers divide signals allocated in CN1 of the Q173CPU(N) into each of the four lines.

(Note-3) : When using the Q173CPU/Q172CPU only.

(3) Basic specifications of Q173CPU(N)/Q172CPU(N)

Motion control specifications

Item		Q173CPUN	Q173CPU	Q172CPUN	Q172CPU
Number. of control axes		32 axes		8 axes	
Operation cycle (default)	SV13	0.88ms/ 1 to 8 axes 1.77ms/ 9 to 16 axes 3.55ms/17 to 32 axes		0.88ms/1 to 8 axes	
	SV22	0.88ms/ 1 to 4 axes 1.77ms/ 5 to 12 axes 3.55ms/13 to 24 axes 7.11ms/25 to 32 axes		0.88ms/1 to 4 axes 1.77ms/5 to 8 axes	
Interpolation functions		Linear interpolation (Max.4 axes), circular interpolation (2 axes), Helical interpolation (3 axes)			
Control modes		PTP(Point to Point), Speed control, Speed-position control, Fixed-pitch feed, Constant speed control, Position follow-up control, Speed switching control, High-speed oscillation control, Synchronous control (SV22)			
Acceleration/ deceleration control		Automatic trapezoidal acceleration/deceleration, S-curve acceleration/deceleration			
Compensation		Backlash compensation, Electronic gear			
Programming language		Motion SFC, dedicated instruction, Mechanical support language (SV22)			
Program capacity		14k steps			
Number of positioning points		3200 points (Positioning data can be designated indirectly)			
Programming tool		IBM PC/AT			
Peripheral I/F		USB(12Mbps)/RS-232(115.2kbps)/SSCNET(5.6Mbps)			
Home position return function		Proximity dog type, Count type, Data set type(2 types)			
JOG operation function		Provided			
Manual pulse generator operation function		Possible to connect 3 modules.			
Synchronous encoder operation function		Possible to connect 12 modules.		Possible to connect 8 modules.	
M-code function		M-code output function provided M-code completion wait function provided			
Limit switch output function		Number of output points 32 point/axis Watch data: Motion control data/Word device			
Absolute position system		Made compatible by setting battery to servo amplifier. (Possible to select the absolute data method or incremental method for each axis)			
Number of SSCNET I/F		5CH		2CH	
Manual pulse generator/ Synchronous encoder/ Servo external signals interface module		Q172LX : 4 modules usable Q172EX : 6 modules usable Q173PX : 4 modules usable (Note)		Q172LX : 1 module usable Q172EX : 4 modules usable Q173PX : 3 modules usable (Note)	

Motion control specifications(continued)

Item	Q173CPUN	Q173CPU	Q172CPUN	Q172CPU
Internal current consumption(5VDC) [A]	1.25	1.75	1.14	1.62
Exterior dimensions (When not installed the Cooling fan unit) [mm(inch)]	98(3.86)(H) × 27.4(1.08)(W) × 114.3(4.50)(D)	118(4.65)(H) × 27.4(1.08)(W) × 89.3(3.52)(D)	98(3.86)(H) × 27.4(1.08)(W) × 114.3(4.50)(D)	118(4.65)(H) × 27.4(1.08)(W) × 89.3(3.52)(D)
Weight [kg]	0.23	0.22	0.22	0.21

(Note) : When using the incremental synchronous encoder by using SV22, you can use 4 modules.
When connecting the manual pulse generator, you can use only one module.

(4) Selection of Q172EX, Q173PX

Item	Synchronous encoder		Manual pulse generator
	Serial absolute	Incremental	
Q173CPU(N)	12 modules		3 modules
Q172CPU(N)	8 modules		
Module selection	Q172EX	Q173PX	

(5) Q173CPU(N)/Q172CPU(N) internal rechargeable battery

• Initial charging of the Q173CPU(N)/Q172CPU(N)

Turn on the power supply and charge the internal rechargeable battery for eight hours or more, before starting to use the Q173CPU(N)/Q172CPU(N). It is possible to provide backup power for the IC-RAM memory for at least 200 hours by charging the internal rechargeable battery for eight hours or more, even if it is empty.

If the battery is charged for five days while applying power eight hours a day, i.e., 40 hours of normal operation, it will be able to provide backup power for the IC-RAM memory for 1100 hours.

Battery backup by the A6BAT/MR-BAT will be necessary if there is a possibility that a continuous power off that lasts longer than the continuous power off hours for the internal rechargeable battery specified in the table below may occur, for example when transporting the system on a ship.

Item		Continuous power off time	
		Guaranteed time (MIN) [h]	Actual time (TYP) [h]
Internal rechargeable battery only	Charging time of 8 hours or more	200	500
	Charging time of 40 hours or more	1100	4300

(6) Motion SFC Performance Specifications

Motion SFC Performance Specifications

Item					Q173CPU(N)/Q172CPU(N)
Program capacity	Code total (Motion SFC chart+ Operation control+ Transition)				287k bytes
	Text total (Operation control+ Transition)				224k bytes
Motion SFC program	Number of Motion SFC programs				256(No.0 to 255)
	Motion SFC chart size/program				Max. 64k bytes (Included Motion SFC chart comments)
	Number of Motion SFC steps/program				Max. 4094 steps
	Number of selective branches/branch				255
	Number of parallel branches/branch				255
	Parallel branch nesting				Up to 4 levels
Operation control program (F/FS) / Transition program (G)	Number of operation control programs				4096 with F(Once execution type) and FS(Scan execution type) combined. (F/FS0 to F/FS4095)
	Number of transition programs				4096(G0 to G4095)
	Code size/program				Max. approx. 64k bytes (32766 steps)
	Number of blocks(line)/program				Max. 8192 blocks (in the case of 4 steps(min)/blocks)
	Number of characters/block				Max. 128 (comment included)
	Number of operand/block				Max. 64 (operand: constants, word device, bit devices)
	( ) nesting/block				Max. 32
	Descriptive Expression	Operation control program			Calculation expression/bit conditional expression
		Transition program			Calculation expression/bit conditional expression/comparison conditional expression
Execute specification	Number of multi executed programs				Max. 256
	Number of multi active programs				Max. 256 steps/all programs
	Executed task	Normal task			Executed in motion main cycle
		Event task (Execution can be masked.)	Fixed cycle		Executed in fixed cycle (0.88ms, 1.77ms, 3.55ms, 7.11ms, 14.2ms)
			External interrupt		Executed when input ON is set among interrupt module QI60 (16 points).
			PLC interrupt		Executed with interrupt from PLC CPU. (When PLC CPU dedicated command S(P).GINT is executed)
		NMI task			Executed when input ON is set among interrupt module QI60 (16 points).
Number of I/O points (X/Y)	8192 points				
Number of real I/O points (PX/PY)	Total 256 points				
Number of devices (Device In the Motion CPU only) (Included the positioning dedicated device)	Number of internal relays (M)				Total M+L : 8192 points
	Number of latch relays (L)				
	Number of link relays (B)				8192 points
	Number of annunciators (F)				2048 points
	Number of special relays (M)				256 points
	Number of data registers (D)				8192 points
	Number of link registers (W)				8192 points
	Number of special registers (D)				256 points
	Motion devices (#)				8192 points
	Number of coasting timers (FT)				1 point (888μs)

2.4.2 Power supply module

(1) Table of the power supply module specifications

This section describes the power supply modules specifications.

Item		Performance specifications	
		Q61P-A1	Q61P-A2
Base loading position		Power supply module loading slot	
Applicable base unit		Q33B, Q35B, Q38B, Q312B, Q65B, Q68B, Q612B	
Input power supply		100 to 120VAC (+10%/-15%) (85 to 132VAC)	200 to 240VAC (+10%/-15%) (170 to 264VAC)
Input frequency		50/60Hz ±5%	
Input voltage distortion factor		5% or less	
Max. input apparent power		105VA	
Inrush current		20A 8ms or less	
Rated output current	5VDC	6A	
	24VDC	——	
Overcurrent protection (Note-1)	5VDC	6.6A or more	
	24VDC	——	
Overvoltage protection (Note-2)	5VDC	5.5 to 6.5V	
	24VDC	——	
Efficiency		70% or more	
Permissible instantaneous power off time (Note-3)		20ms or less	
Dielectric withstand voltage		Across inputs/LG and outputs/FG 2,830VAC rms / 3 cycles (Altitude : 2000m (6562ft.))	
Insulation resistance		Across inputs and outputs (LG and FG separated), across inputs and LG/FG, across outputs and FG/LG. 10MΩ or more by insulation resistance tester(500VDC)	
Noise immunity		• By noise simulator of 1,500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency • Noise voltage IEC61000-4-4, 2kV	
Operation indication		LED indication (Lit at 5VDC output)	
Fuse		Built-in (Unchangeable by user)	
Contact output section	Application	$\overline{ERR}$ contact (contact switched off (opened: normally closed contact) at an error stop of CPU), for CPU module operating status output	
	Rated switching voltage/current	24VDC, 0.5A	
	Minimum switching load	5VDC, 1mA	
	Response time	OFF to ON: 10ms or less. ON to OFF: 12ms or less.	
	Life time	Mechanical : 2 million times or more Electrical : 100 thousand times at rated switching voltage/current or more	
	Surge suppressor	None	
	Fuse	None	
Terminal screw size		M3.5 × 7	
Applicable wire size		0.75 to 2mm^2	
Applicable crimping terminal		RAV1.25 to 3.5, RAV2 to 3.5	
Applicable tightening torque		59 to 78 × 10^{-2} N•m	
Exterior dimensions[mm(inch)]		98(H) × 55.2(W) × 90(D) (3.86(H) × 2.17(W) × 3.55(D))	
Weight [kg]		0.31	

The power supply module specifications (continued)

Item		Performance specifications	
		Q63P	Q64P
Base loading position		Power supply module loading slot	
Applicable base unit		Q33B, Q35B, Q38B, Q312B, Q65B, Q68B, Q612B	
Input power supply		24VDC (+30%/-35%) (15.6 to 31.2VDC)	100 to 120VAC/200 to 240VAC (+10%/-15%) (85 to 132VAC/170 to 264VAC)
Input frequency		——	50/60Hz ±5%
Input voltage distortion factor		——	5% or less
Max. input apparent power		45W	160VA
Inrush current		100A 1ms or less	20A 8ms or less
Rated output current	5VDC	6A	8.5A
	24VDC	——	——
Overcurrent protection (Note-1)	5VDC	6.6A or more	9.9 to 14.4A
	24VDC	——	
Overvoltage protection (Note-2)	5VDC	5.5 to 6.5V	
	24VDC	——	
Efficiency		70% or more	
Permissible instantaneous power off time (Note-3)		10ms or less(at 24VDC input)	20ms or less
Dielectric withstand voltage		500VAC across primary and 5VDC	Across inputs/LG and outputs/FG 2,830VAC rms/3 cycles (Altitude : 2000m (6562ft.))
Insulation resistance		10MΩ or more by insulation resistance tester	Across inputs and outputs (LG and FG separated), across inputs and LG/FG, across outputs and FG/LG 10Ω or more by insulation resistance tester(500VDC)
Noise immunity		• By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency	• By noise simulator of 1,500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency • Noise voltage IEC61000-4-4, 2kV
Operation indication		LED indication (Lit at 5VDC output)	
Fuse		Internal (Unchangeable by user)	
Contact output section	Application	$\overline{\text{ERR}}$ contact (contact switched off (opened: normally closed contact) at an error stop of CPU), for CPU module operating status output	
	Rated switching voltage/current	24VDC, 0.5A	
	Minimum switching load	5VDC, 1mA	
	Response time	OFF to ON: 10ms or less. ON to OFF: 12ms or less	
	Life time	Mechanical : 2 million times or more Electrical : 100 thousand times at rated switching voltage/current or more	
	Surge suppressor	None	
	Fuse	None	
Terminal screw size		M3.5 × 7	
Applicable wire size		0.75 to 2mm^2	
Applicable crimping terminal		RAV1.25 to 3.5, RAV2 to 3.5	
Applicable tightening torque		59 to 78 × 10^{-2} N•m	
Exterior dimensions[mm(inch)]		98(H) × 55.2(W) × 90(D) (3.86(H) × 2.17(W) × 3.55(D))	98(H) × 55.2(W) × 115(D) (3.86(H) × 2.17(W) × 4.53(D))
Weight [kg]		0.33	0.40

POINTS

(Note-1) : Overcurrent protection

The overcurrent protection device shuts off the 5V, 24VDC circuit and stops the system if the current flowing in the circuit exceeds the specified value. When this device is activated, the power supply module LED is switched OFF or dimly lit. If this happens, eliminate the cause of the overcurrent and start up the system again.

(Note-2) : Overvoltage protection

The overvoltage protection device shuts off the 5VDC circuit and stops the system if a voltage of 5.5 to 6.5V is applied to the circuit. When this device is activated, the power supply module LED is switched OFF. If this happens, switch the input power OFF, then ON to restart the system. The power supply module must be changed if the system is not booted and the LED remains OFF.

(Note-3) : Permissible instantaneous power off time

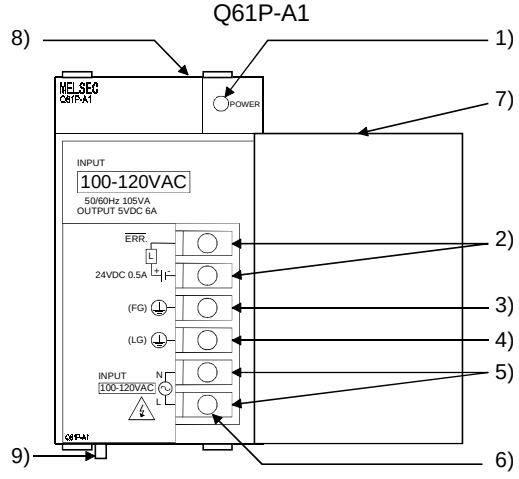
Permissible instantaneous power off is selected to use the power supply module.

(2) Names of Parts and Setting

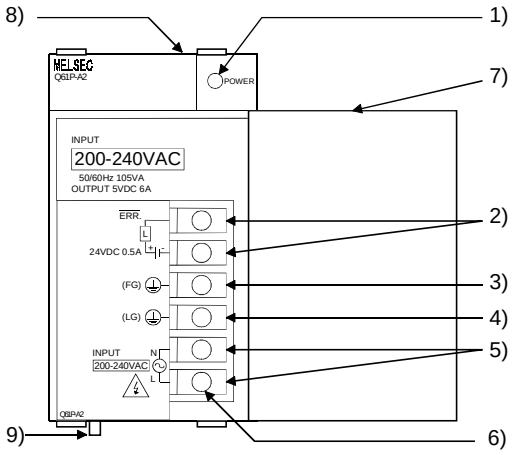
This section describes the names of the parts of each power module.

(a) Q61P-A1, Q61P-A2, Q63P, Q64P

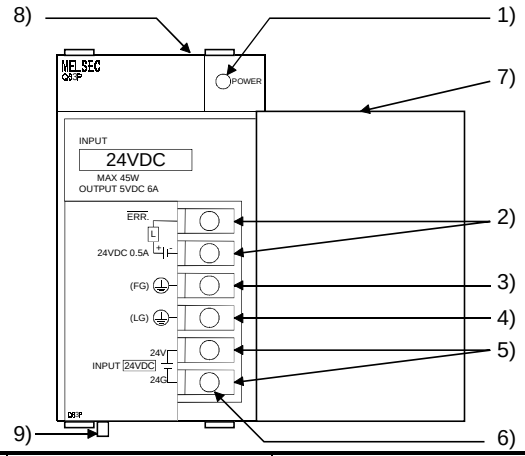
Q61P-A1



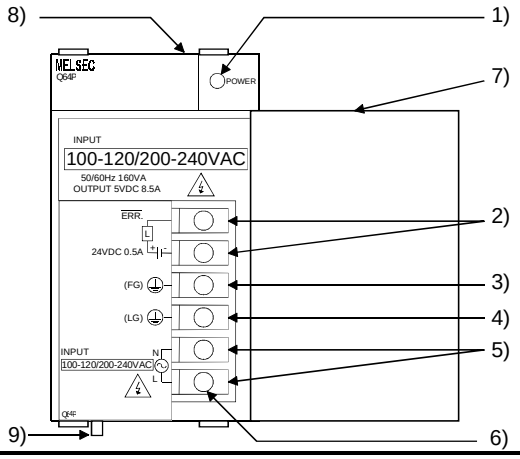
Q61P-A2



Q63P



Q64P



No.	Name	Application
1)	POWER LED	5VDC power indicator LED
2)	$\overline{\text{ERR}}$ terminals	Turned OFF (opened) when a stop error occurs in the CPU module. Normally off when loaded in an extension base unit.
3)	FG terminal	Ground terminal connected to the shield pattern of the printed circuit board.
4)	LG terminal	Grounding for the power supply filter.
5)	Power input terminals	• Used to connect a 100VAC or 200VAC power supply.(Q61P-A1, Q61P-A2, Q64P) • Used to connect a 24VDC power supply.(Q63P)
6)	Terminal screw	M3.5×7
7)	Terminal cover	Protective cover of the terminal block
8)	Module fixing screw	Used to fix the module to the base unit. (M3×12 screw, tightening torque : 36 to 48×10^{-2} N•m)
9)	Module loading lever	Used to install the module into the base unit.

POINTS

(1) The Q61P-A1 is dedicated for inputting a voltage of 100VAC. Do not input a voltage of 200VAC into it or trouble may occur on the Q61P-A1.

Power module type	Supply power voltage	
	100VAC	200VAC
Q61P-A1	Operates normally.	Power module causes trouble.
Q61P-A2	Power module does not cause trouble. CPU cannot be operated.	Operates normally.

(2) The Q63P is dedicated for inputting a voltage of 24VDC. Do not input a voltage of except 24VDC into it or trouble may occur on the Q63P.

(3) Be sure to ground the earth terminal FG and LG.(Ground resistance: 100Ω or less)

(3) Selection of the power supply module

The power supply module is selected according to the total of current consumption of the I/O modules, special function module, and peripheral devices supplied by its power module. (Select the power supply module also consideration of the current consumption of the peripheral device connected to the MR-HENC or MR-HDP01, etc.)

For information about the current consumption of 5VDC of the I/O modules, special function module, and peripheral device, refer to the QCPU(Q mode) User's Manual(Hardware Design, Maintenance and Inspection).

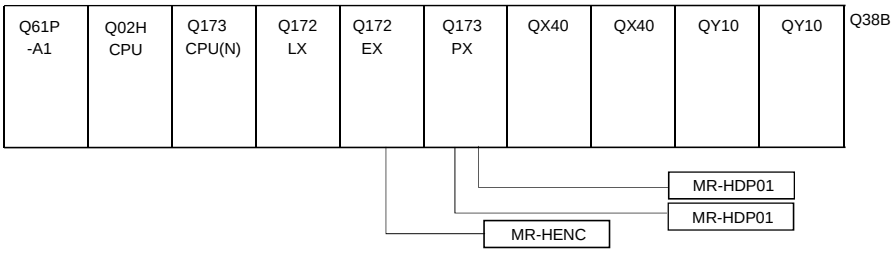
The current consumption of Motion controller is as follows.

Part name	Model name	Description	Current consumption 5VDC [A]
Motion CPU module	Q173CPUN	Max.32 axes control	1.25
	Q173CPU	Max.32 axes control, with Cooling fan unit	1.75
	Q172CPUN	Max.8 axes control	1.14
	Q172CPU	Max.8 axes control, with Cooling fan unit	1.62
Servo external signal interface module	Q172LX	Servo external signal 8 axes (FLS, RLS, STOP, DOG/CHANGE×8)	0.05
Serial absolute synchronous encoder interface module (Note)	Q172EX	Serial absolute synchronous MR-HENC interface×2 Tracking input 2 points	0.07
Manual pulse generator interface module (Note)	Q173PX	Manual pulse generator MR-HDP01/ Synchronous encoder interface×3, Tracking input 3 points	0.11
Manual pulse generator	MR-HDP01	Pulse resolution: 25PLS/rev (100 PLS/rev after magnification by 4) Permitted axial loads Radial load: Max.19.6N Thrust load: Max.9.8N Permitted speed: 200r/min (Normal rotation)	0.06
Serial absolute synchronous encoder	MR-HENC	Resolution: 16384PLS/rev Permitted speed: 4300r/min	0.15
Cooling fan unit	Q170FAN	Cooling fan of the Motion CPU module	0.08

(Note) : Select the power supply module also consideration of the current consumption of the connecting peripheral device (MR-HENC or MR-HDP01).

(4) Example of the power supply selection calculation (When using the Q173CPU.)

(a) System configuration



(b) 5VDC current consumption of each module

Q02HCPU	: 0.64 [A]	Q173PX	: 0.11 [A]
Q173CPU	: 1.75 [A]	MR-HDP01	: 0.06 [A]
Q172LX	: 0.05 [A]	QX40	: 0.05 [A]
Q172EX	: 0.07 [A]	QY10	: 0.43 [A]
MR-HENC	: 0.15 [A]	Q38B	: 0.114 [A]

(c) Power consumption of overall modules

I_{5V} = 0.64 + 1.75 + 0.05 + 0.07 + 0.15 + 0.11 + 0.06 × 2 + 0.05 × 2 + 0.43 × 2 + 0.114 = 3.964[A]

Select of the power supply module(Q61P-A1(100VAC)6A) according to this internal current consumption 3.964[A].

(Note) : Configure the system in such a way that the total current consumption at 5VDC of all the modules is less than the allowable value.

2.4.3. Base unit and extension cable

This section describes the specifications of the extension cables for the base units (CPU base unit or extension base unit) used in the system, and the specification standards of the extension base unit.

(1) Table of the base unit specification

(a) CPU base unit specifications

Item \ Type	Q33B	Q35B	Q38B	Q312B
Number of I/O modules	3	5	8	12
Possibility of extension	Extendable			
Applicable module	Q series modules			
5VDC internal current consumption [A]	0.105	0.110	0.114	0.121
Fixing hole size	M4 screw hole or ϕ4.5 hole (for M4 screw)			
Exterior dimensions [mm(inch)]	189(W)×98(H) × 44.1(D) (7.43(W)×3.86(H) × 1.74(D))	245(W)×98(H) × 44.1(D) (9.65(W)×3.86(H) × 1.74(D))	328(W)×98(H) × 44.1(D) (12.92(W)×3.86(H) ×1.74(D))	439(W)×98(H) × 44.1(D) (17.30(W)×3.86(H) × 1.74(D))
Weight [kg]	0.21	0.25	0.35	0.45
Attachment	Fixing screw M4×14 4 pieces (DIN rail fixing adapter is optional)			
DIN rail fixing adapter type	Q6DIN3	Q6DIN2	Q6DIN1	

(b) Extension base unit specifications

Item \ Type	Q63B	Q65B	Q68B	Q612B
Number of I/O modules	3	5	8	12
Possibility of extension	Extendable			
Applicable module	Q series modules			
5VDC internal current consumption [A]	0.105	0.110	0.114	0.121
Fixing hole size	M4 screw hole or ϕ4.5 hole (for M4 screw)			
Exterior dimensions [mm(inch)]	189(W)×98(H) × 44.1(D) (7.43(W)×3.86(H) × 1.74(D))	245(W)×98(H) × 44.1(D) (9.65(W)×3.86(H) × 1.74(D))	328(W)×98(H) × 44.1(D) (12.92(W)×3.86(H) ×1.74(D))	439(W)×98(H) × 44.1(D) (17.30(W)×3.86(H) × 1.74(D))
Weight [kg]	0.23	0.25	0.35	0.45
Attachment	Fixing screw M4×14 4 pieces(DIN rail fixing adapter is optional)			
DIN rail fixing adapter type	Q6DIN3	Q6DIN2	Q6DIN1	

(2) Table of the extension cable specifications

The list below describes the specifications of the extension cables which can be used for the Q CPU system.

Item \ Type	QC05B	QC06B	QC12B	QC30B	QC50B	QC100B
Cable length[m(ft.)]	0.45(1.48)	0.6(1.96)	1.2(3.94)	3.0(9.84)	5.0(16.40)	10.0(32.8)
Application	Connection between the CPU base unit and extension base unit, or connection between the extension base units.					
Weight [kg]	0.15	0.16	0.22	0.40	0.60	1.11

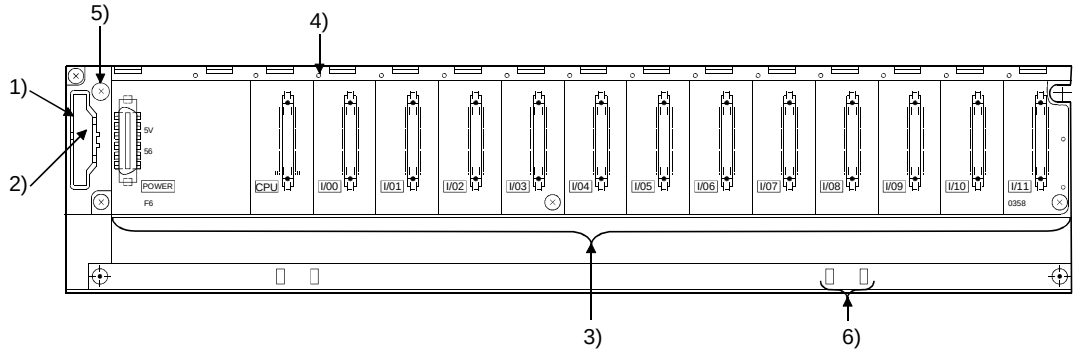
POINT

When the extension cables are used in combination, limit the overall length of the combined cable to 13.2m (43.28ft.).

(3) Names of parts of the base unit

Names of parts of the base unit are described below.

(a) CPU base unit (Q33B, Q35B, Q38B, Q312B)



No.	Name	Application
1)	Extension cable connector	Connector for sending and receiving signals from the extension base unit, to which the extension cables are connected.
2)	Base cover	Protective cover of extension cable connector. Before an extension cable is connected, the area of the base cover surrounded by the groove under the word "OUT" on the base cover must be removed with a tool such as nippers.
3)	Module connector	Connector for installing the power supply module, CPU module, I/O modules, and intelligent function module. To the connectors located in the spare space where these modules are not installed, attach the supplied connector cover or the blank cover module QG60 to prevent entry of dirt.
4)	Module fixing screw hole	Screw hole for fixing the module to the base. Screw size: M3 × 12
5)	Base fixing hole	Hole for fixing this base unit onto the panel of the control panel (for M4 screw)
6)	DIN rail adapter fixing hole	Hole for fixing DIN rail adapter

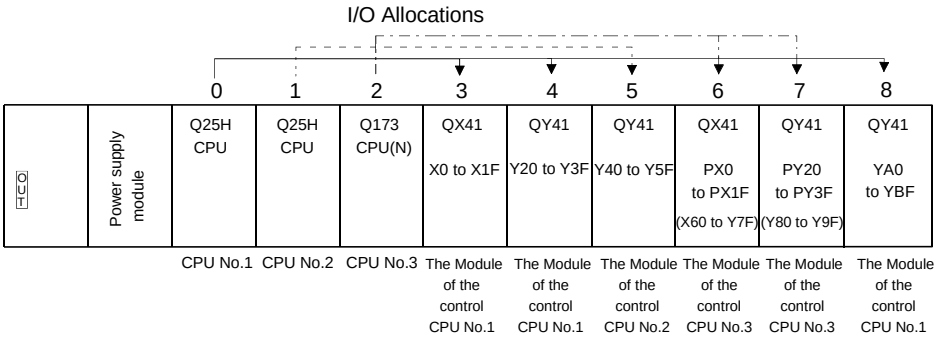
(4) I/O allocations

It is possible to allocate unique I/O No.s for each Motion CPU independently of the PLC's I/O No.s. (I/O No.s are unique between the Q series PLC CPU within a given system, but the I/O No.s of the Motion CPU are unique for each Motion CPU.)

ON/OFF data input to the Motion CPU is handled via input devices PX□□, while ON/OFF data output from the Motion CPU is handled via output devices PY□□.

It is not mandatory to match the I/O device PX/PY No.s used in the motion program with the PLC I/O No.s; but it is recommended to make them match as much as possible.

The following figure shows an example of I/O allocation.



(Note-1) : When the number of the modules to be installed is 32 points.
(Note-2) : When the PX/PY No. does not match the PLC I/O No.

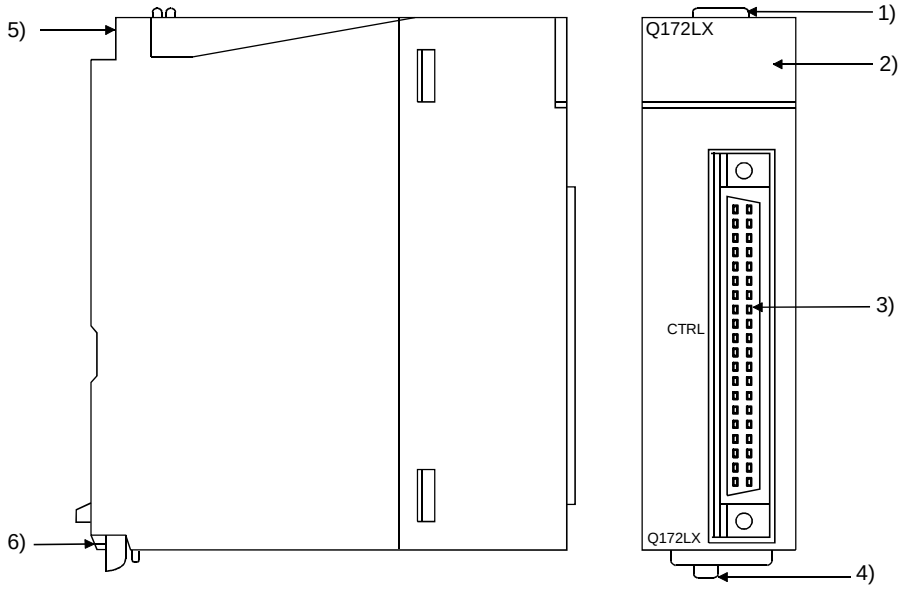
Refer to the Q173CPU/Q172CPU Programming Manual (Motion SFC) about the I/O allocation setting method,.
Refer to the QCPU(Q Mode) User's Manual(Hardware Design, Maintenance and Inspection) about the I/O allocation setting method of the Qn(H) CPU,.

POINT
I/O device of the Motion CPU can be set in the range PX/PY000 to PX/PYFFF. The real I/O points must be 256 points or less. (As for the I/O No., it is possible not to continue.)

2.4.4 Q172LX Servo external signals interface module

Q172LX receives external signals (servo external signal) required for positioning control.

(1) Q172LX



No.	Name	Application
1)	Module fixing hook	Hook used to fix the module to the base unit. (Quick release installation)
2)	Mode judging LED	Display the servo external input status from the external equipment. LED: 0 to 1F — Details: Indicates to display the servo external signal input status of each axis.
3)	CTRL connector	The servo external signal input connector of each axis.
4)	Module loading lever	Used to install the module to the base unit.
5)	Module fixing screw hole	Hole for the screw used to fix to the base unit. (M3×12 screw : Purchase from the other supplier)
6)	Module fixing hook	Hook used to fix to the base unit.

(2) Performance specifications

Item		Specifications
Number of inputs		Servo external signals : 32 points (Upper stroke limit, Lower stroke limit, Stop input, Proximity dog/Speed-position switching signal) (4 points × 8 axes)
Input method		Sink/Source type
Isolation method		Photocoupler
Rated input voltage		12/24VDC
Rated input current		12VDC 2mA/24VDC 4mA
Operating voltage range		10.2 to 26.4VDC (12/24VDC +10/ -15%, ripple ratio 5% or less)
ON voltage/current		Min.10VDC or more/2.0mA or more
OFF voltage/current		Max.1.8VDC or less/0.18mA or less
Input resistance		Approx. 5.6KΩ
Response time of the Upper/Lower stroke limit and STOP signal.	OFF to ON	1ms
	ON to OFF	
Response time of the proximity dog, Speed-position switching signal.	OFF to ON	0.4ms/0.6ms/1ms (CPU parameter setting, Default 0.4ms)
	ON to OFF	
Common terminal arrangement		32 points/common (common terminal: B1, B2)
Indicates to display		ON indication (LED)
External connector type		40 pin connector
Applicable wire size		$0.3mm^2$
Applicable connector for the external connection		A6CON1(Attachment), A6CON2, A6CON3(Optional)
Applicable connector/ Terminal block converter module		A6TBXY36, A6TBXY54, A6TBXY70(Optional)
Number of I/O occupying points		32 points(I/O allocation: Intelligent, 32 points)
Internal current consumption(5VDC) [A]		0.05
Exterior dimensions[mm(inch)]		98(H)× 27.4(W)×89.3(D) (3.86(H)×1.08(W)×3.52(D))
Weight [kg]		0.15

(3) Connection of servo external signals interface module

(a) Servo external signals

There are the following servo external signals.

The Q172LX is assigned a set of input No.s per axis. Make the system setting of the positioning software package to determine the I/O No.s corresponding to the axis No.s.

Servo external signal	Application	Number of points on one Q172LX
Upper stroke limit input (FLS)	For detection of upper and lower stroke limits.	32 points (4 points/8 axes)
Lower stroke limit input (RLS)		
Stop signal input (STOP)	For stopping under speed or positioning control.	
Proximity dog/ Speed-position switching input (DOG/CHANGE)	For detection of proximity dog at proximity dog or count type home position return of for switching from speed to position switching control.	

POINT

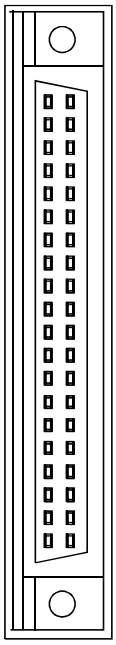
Signal No. 1 to 8 can be assigned to the specified axis. To make assignment, make the system settings of the positioning software package.

(b) The pin layout of the CTRL connector

Use the CTRL connector at the Q172LX module front to connect the servo external signals.

The following pin layout of the Q172LX CTRL connector viewed from the front.

The pin layout and connection description of the CTRL connector are described below.



CTRL connector

Signal No.	Pin No.	Signal Name	Pin No.	Signal Name	Signal No.
1	B20	FLS1	A20	FLS5	5
	B19	RLS1	A19	RLS5	
	B18	STOP1	A18	STOP5	
	B17	DOG1/CHANGE1	A17	DOG5/CHANGE5	
2	B16	FLS2	A16	FLS6	6
	B15	RLS2	A15	RLS6	
	B14	STOP2	A14	STOP6	
	B13	DOG2/CHANGE2	A13	DOG6/CHANGE6	
3	B12	FLS3	A12	FLS7	7
	B11	RLS3	A11	RLS7	
	B10	STOP3	A10	STOP7	
	B9	DOG3/CHANGE3	A9	DOG7/CHANGE7	
4	B8	FLS4	A8	FLS8	8
	B7	RLS4	A7	RLS8	
	B6	STOP4	A6	STOP8	
	B5	DOG4/CHANGE4	A5	DOG8/CHANGE8	
	B4	No connect	A4	No connect	
	B3	No connect	A3	No connect	
	B2	COM	A2	No connect	
	B1	COM	A1	No connect	

Applicable connector model name

A6CON1 type soldering type connector
FCN-361J040-AU connector (FUJITSU TAKAMISAWA COMPONENT LIMITED)
FCN-360C040-B connector cover
} (Attachment)

A6CON2 type Crimp-contact type connector
A6CON3 type Pressure-displacement type connector
} (Optional)

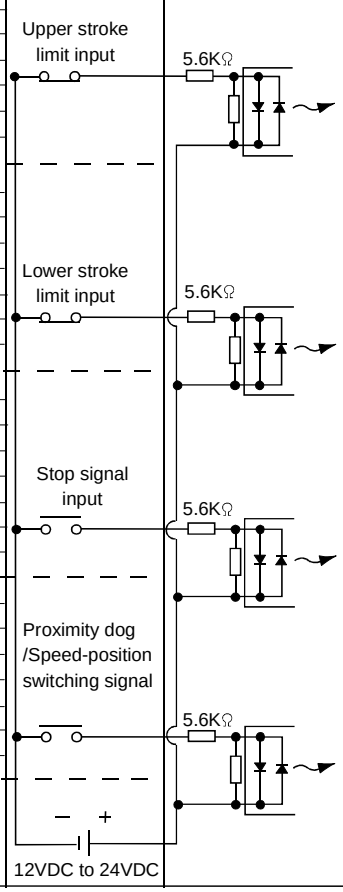
DOG/CHANGE, STOP, RLS, FLS functions of each axis(1 to 8)

DOG/CHANGE . . . . . Proximity dog/Speed-position switching signal
STOP . . . . . Stop signal
RLS . . . . . Lower stroke limit
FLS . . . . . Upper stroke limit

For information about signal details,refer to the programing manual.

(4) Interface between CTRL connector and servo external signal

Input or Output	Signal name	CTRL connector	LED
Input	FLS1	B20	0
	FLS2	B16	4
	FLS3	B12	8
	FLS4	B8	C
	FLS5	A20	10
	FLS6	A16	14
	FLS7	A12	18
	FLS8	A8	1C
	RLS1	B19	1
	RLS2	B15	5
	RLS3	B11	9
	RLS4	B7	D
	RLS5	A19	11
	RLS6	A15	15
	RLS7	A11	19
	RLS8	A7	1D
	STOP1	B18	2
	STOP2	B14	6
	STOP3	B10	A
	STOP4	B6	E
	STOP5	A18	12
	STOP6	A14	16
	STOP7	A10	1A
	STOP8	A6	1E
	DOG/CHANGE1	B17	3
	DOG/CHANGE2	B13	7
	DOG/CHANGE3	B9	B
	DOG/CHANGE4	B5	F
	DOG/CHANGE5	A17	13
	DOG/CHANGE6	A13	17
	DOG/CHANGE7	A9	1B
	DOG/CHANGE8	A5	1F
	Power supply	B1 B2	



Specification	Description
• Supply voltage 12 to 24 VDC (10.2 to 26.4 VDC, stabilized power supply)	FLS
	RLS
• High level 10.0 VDC or more/ 2.0mA or more	
	STOP
• Low level 1.8 VDC or less/ 0.18mA or less	
	DOG/CHANGE
	Common terminals for motion control signals,external signal.

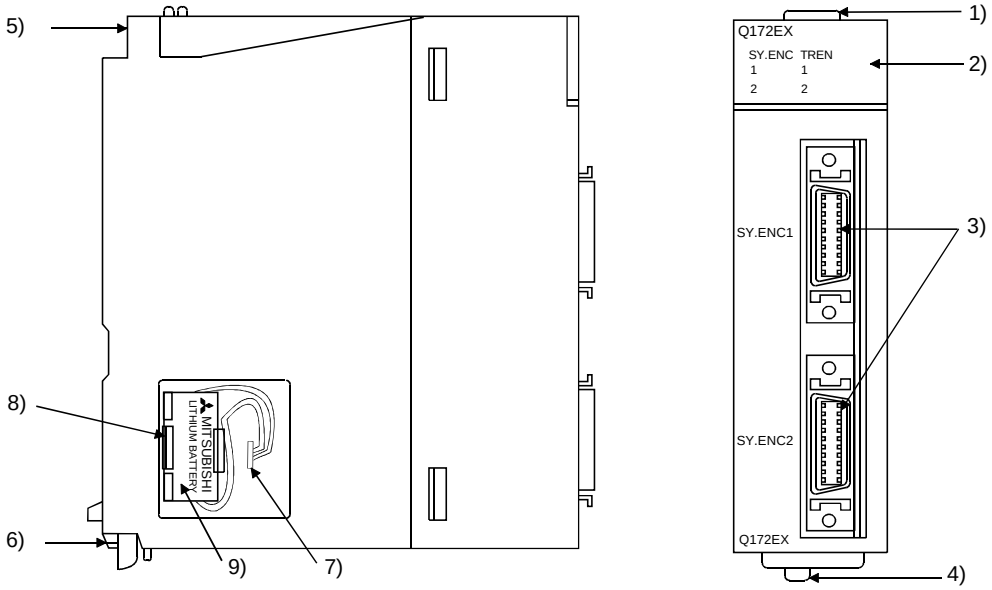
⚠ CAUTION

- Always use a shield cable for connection of the CTRL connector and external equipment, and avoid running it close to or bundling it with the power and main circuit cables to minimize the influence of electromagnetic interface. (Separate them more than 200mm (0.66ft.) away.)
- Connect the shield wire of the connection cable to the FG terminal of the external equipment.
- Make parameter setting correctly. Incorrect setting may disable the protective functions such as stroke limit protection or may not provide the brake output, damaging the module.
- Always wire the cables when power is off. Not doing so can damage the output circuit if any of the output signal cables makes contact with the power supply or the output signal cables make contact with each other.
- Use extreme care when wiring the cables. Wrong wiring can damage the internal circuitry.

2.4.5 Q172EX Serial absolute synchronous encoder interface module

Q172EX receive external signals required for serial absolute synchronous encoder.

(1) Q172EX



No.	Name	Application
1)	Module fixing hook	Hook used to fix the module to the base unit. (Quick release installation)
2)	Mode judging LED	Display the input status from the external equipment. LED: SY.ENC 1, 2 — Indicates to display the signal input status of each serial absolute synchronous encoder. (When the serial absolute synchronous encoder cable connected property, LED is turned on.) LED: TREN 1, 2 — Indicates to display the signal status of tracking enable.
3)	SY. ENC connector	Input connector of the serial absolute synchronous encoder.
4)	Module loading lever	Used to install the module to the base unit.
5)	Module fixing screw hole	Hole for the screw used to fix to the base unit (M3×12 screw : Purchase from the other supplier)
6)	Module fixing hook	Hook used to fix to the base unit.
7)	Battery connector	For connection of battery lead wire.
8)	Battery holder	Used to the Install the Battery (A6BAT/MR-BAT) to the holder.
9)	Battery (A6BAT/MR-BAT)	For Serial absolute synchronous encoder battery backup.

(2) Performance specifications

(a) Tracking enable signal input

Item		Specifications
Number of inputs		Tracking enable signal : 2 points
Input method		Sink/Source type
Isolation method		Photocoupler
Rated input voltage		12/24VDC
Rated input current		12VDC 2mA/24VDC 4mA
Operating voltage range		10.2 to 26.4VDC (12/24VDC +10/ -15%, ripple ratio 5% or less)
ON voltage/current		10VDC or more/2.0mA or more
OFF voltage/current		1.8VDC or less/0.18mA or less
Input resistance		Approx. 5.6KΩ
Response time	OFF to ON	0.4ms/0.6ms/1ms (CPU parameter setting, Default 0.4ms)
	ON to OFF	
Common terminal arrangement		1 point/common (Common terminal: TREN.COM)
Indicates to display		ON indication (LED)

(b) Serial absolute synchronous encoder input

Item	Specifications
Applicable signal types	Differential-output type : (SN75C11168 or equivalent)
Transmission method	Serial communications
Synchronous method	Counter-clock-wise (viewed from end of shaft)
Communication speed	2.5Mbps
Applicable types	MR-HENC
Position detection method	Absolute(ABS) method
Resolution	16384PLS/rev(14bit)
Number of modules	2/module
External connector type	20 pin connector
Applicable connector for the external connection	MR-J2CNS(Optional)
Applicable wire	UL20276 AWG#22 6Pair
Recommended cables	MR-JHSCBL□M-H (□=cable length 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.)) (Note)
Cable length	Max. 30m(98.4ft.)
Back up the absolute position.	Depends on A6BAT/MR-BAT.
Battery service life time(value in actual)	15000[h], (Example of encoders×2, Ambient temperature 40°C (104°F))
	30000[h], (Example of encoders×1, Ambient temperature 40°C (104°F))
Number of I/O occupying points	32 points(I/O allocation: Intelligent, 32 points)
Internal current consumption(5VDC)[A]	0.07
Exterior dimensions[mm(inch)]	98(H)×27.4(W)×89.3(D) (3.86(H)×1.08(W)×3.52(D))
Weight [kg]	0.15

(Note) : You can use these cables when the tracking enable signal is not used.
When the tracking enable signal is used, fabricate the cable on the customer side.

(3) Select to number of the synchronous encoder modules.

Synchronous encoders are available in voltage output type(incremental), differential output type(incremental) and serial absolute output type(MR-HENC). Q172EX can be connected to only serial absolute output type(MR-HENC). When using the incremental synchronous encoder of voltage output type or differential output type, must be used Q173PX. (The synchronous encoders are used only in the SV22 virtual mode.)

In addition, the usable numbers of synchronous encoders differ depending on the modules.

The following number of serial absolute synchronous encoders and incremental synchronous encoders combined can be used.

Motion CPU module	Synchronous encoder
Q173CPU(N)	Max. 12 modules (Q172EX: Max. 6 modules)
Q172CPU(N)	Max. 8 modules (Q172EX: Max. 4 modules)

• Tracking enable signal

Tracking enable signal of Q172EX is used as a high-speed reading function. It can not be used, as the input start signal which start the input form synchronous encoders

When using the inputs start signal which start the input from synchronous encoder, must be used Q173PX. (Type of synchronous encoder is voltage output(incremental)or differential output(incremental).)

The external input signal of the synchronous encoder is indicated below.

External input signal of the synchronous encoder	Item	Number of points on one Q172EX
Tracking enable signal input	High-speed reading function	2 points

(4) Connection of synchronous encoder interface module.

(a) Connection with serial absolute synchronous encoder (MR-HENC)

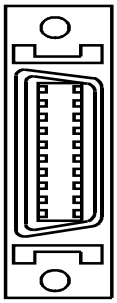
Use the SY.ENC connector at the Q172EX module front to connect the serial absolute synchronous encoder(MR-HENC).

When tracking enable signal is not used, use the MR-JHSCBL□M-H encoder cable between the serial absolute synchronous encoder (MR-HENC) and SY.ENC connector.

The following pin layout of the Q172EX SY.ENC connector viewed from the front.

The pin layout and connection description of the SY.ENC connector are described below.

SY.ENC connector



Pin No.	Signal name	Pin No.	Signal name
1	LG	11	LG
2	LG	12	LG
3	LG	13	LG
4	TREN	14	TREN.CO
5	No connect	15	No connect
6	MD	16	MDR
7	MR	17	MRR
8	No connect	18	P5
9	BAT	19	P5
10	P5	20	P5

Applicable connector model names
10120-3000VE connector
10320-52F0-008 connector cover
(3M make)

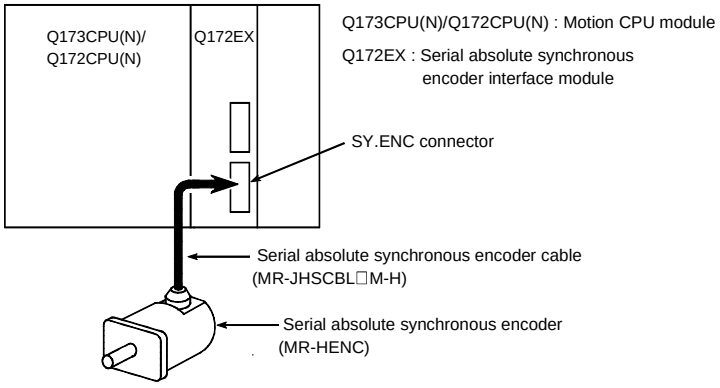
(Note) : Do not connect a wire to MD(6Pin), MDR(16Pin).

(b) Interface with external equipment

The interface between the SY.ENC connector and external equipment is described below.

1) Wiring precautions

Ensure the connector lock after connecting the connector.



(5) Interface between SY.ENC connector and external equipment

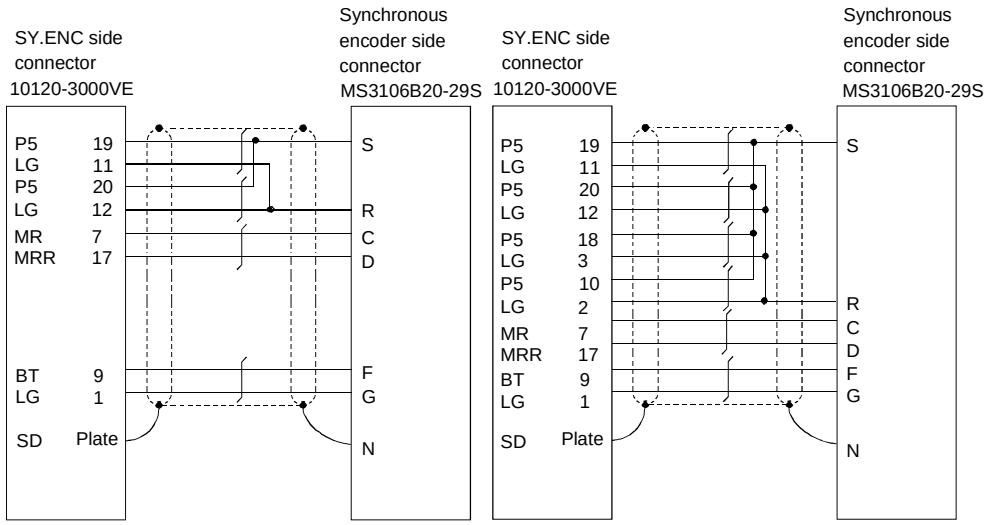
Input or Output	Signal name	Pin No. SY.ENC connector	Wiring example	Internal circuit	Specification	Description
Input	MR	7	Serial absolute synchronous encoder	5VDC, Battery	• Transmission method: serial communications • Position detection method: absolute	
	MRR	17				
	P5	10 18 19 20				
	LG	1 2 3 11 12				
	BAT	9				
	TREN	4	12VDC to 24VDC	5.6KΩ		
	TREN. COM	14				
	SD	plate				

⚠ CAUTION

- Always use a shield cable for connection of the SY.ENC connector and external equipment, and avoid running it close to or bundling it with the power and main circuit cables to minimize the influence of electromagnetic interface. (Separate them 200mm (0.66 ft.) or more away.)
- Connect the shield wire of the connection cable to the FG terminal of the external equipment.
- When increasing the cable length, use the cable 30m(98.36ft.) or less. Note that the cable should be run in the shortest possible distance to avoid induced noise.
- Always wire the cables when power is off. Not doing so can damage the output circuit if any of the contact with each other.
- Use extreme care when wiring the cables. Wrong wiring can damage the internal circuit.

(6) Details of encoder cable connections

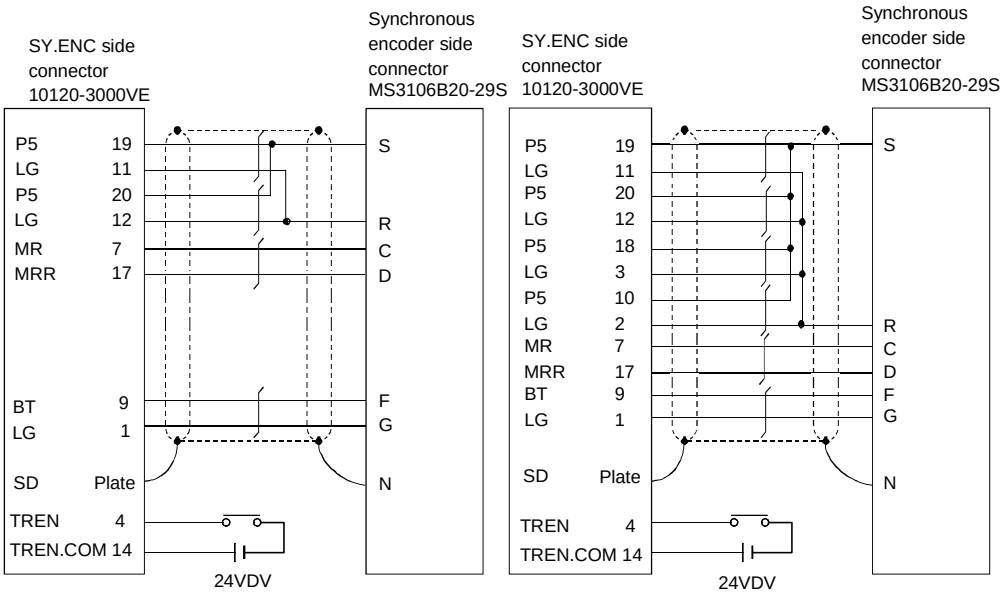
(a) When not using tracking enable signal



MR-JHSCBL5M-H
(Less than 10m(32.79ft.)) (Note-1),(Note-3)

MR-JHSCBL10M-H to MR-JHSCBL30M-H
(10 to 30m) (Note-1),(Note-4)
(32.79 to 98.36ft.)

(b) When using tracking enable signal (Note-5)



Cable length 10m(32.79ft.) (Note-3)

Cable length 10 to 30m (Note-4)
(32.79 to 98.36ft.)

Model name for encoder connector set (MR-J2CNS) (Note-2)

(Note-1) : Encoder cables are the same as HC-SFS/HC-RFS/HC-UFS(2000r/min) series motor cable.
(Note-2) : Encoder connector sets are the same as HC-SFS/HC-RFS/HC-UFS(2000r/min) series motor encoder connector set.
(Note-3) : Be sure to use a wire model name AWG#24.
(Note-4) : Be sure to use a wire model name AWG#22.
(Note-5) : When using tracking enable signal, fabricate the encoder cable by customer side.

(7) Connection of the battery

This section describes the battery specifications, handling precautions and installation of the Q172EX.

(a) Specifications

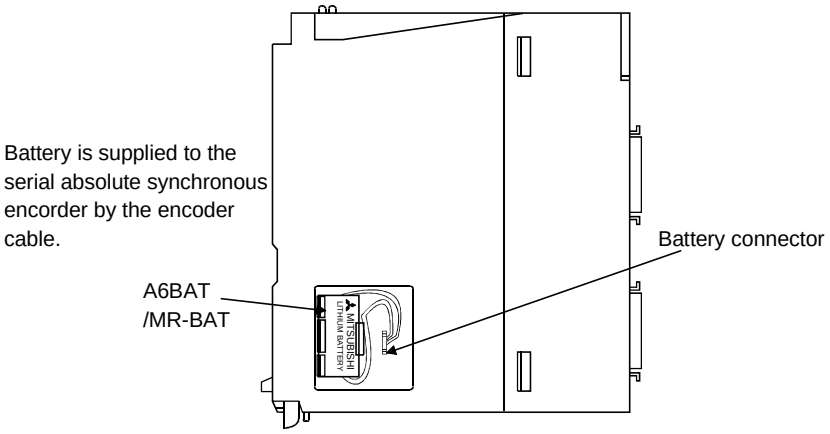
The specifications of the battery for memory back-up are shown in the table below.

Battery Specifications

Item \ Model name	A6BAT/MR-BAT
Classification	Manganese dioxide lithium primary battery
Normal voltage[V]	3.6
Battery discharge capacity [mAh]	1600
Battery warranty period	5 years
Applications	For backup absolute positioning data of the serial absolute synchronous encoder(MR-HENC)
Exterior dimensions[mm(inch)]	ϕ16(0.63) × 30(1.18)

(b) Battery replacement

For Battery replacement procedure, refer to section 6.4.2.



(c) Battery service life time

	Battery service life time	
	Guaranteed time(MIN) [h]	Actual time(TYP) [h]
MR-HENC 1 pcs.	10000	30000
MR-HENC 2 pcs.	5000	15000

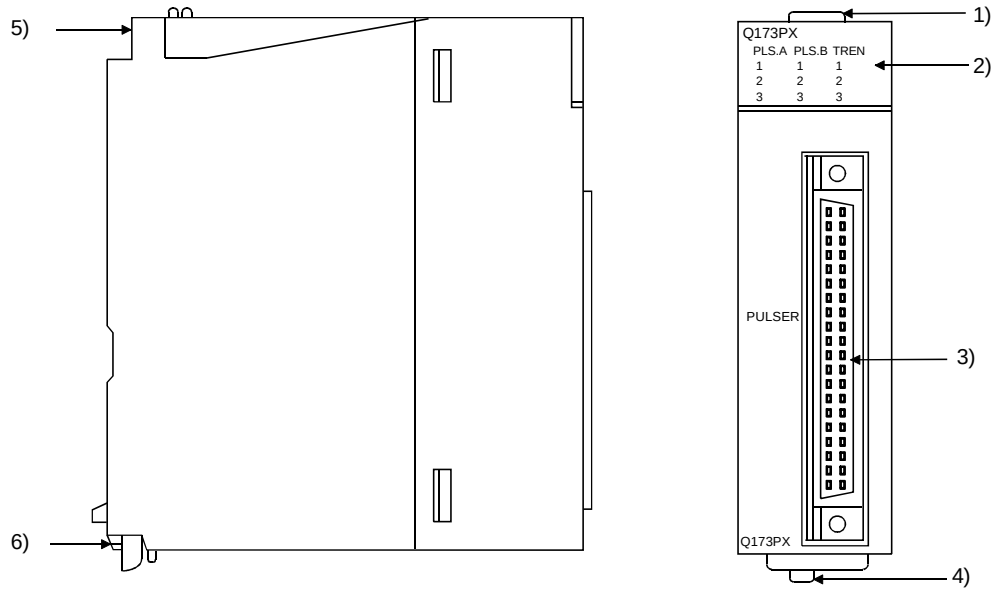
⚠ CAUTION

- Do not short a battery.
- Do not disassemble a battery.
- Do not burn a battery.
- Do not overheat a battery.
- Do not solder the battery terminals.

2.4.6 Q173PX Manual pulse generator interface module

Q173PX receive external signals required for Manual pulse generator and Incremental synchronous encoder (Voltage-output/Open collector type/Differential-output type).

(1) Q173PX



No.	Name	Application
1)	Module fixing hook	Hook used to fix the module to the base unit. (Quick release installation)
2)	Mode judging LED	Display the input status from the external equipment. LED: PLS.A 1 to 3, PLS.B 1 to 3 — Input signal status of the Manual pulse generator/Incremental synchronous encoder phases A and B LED: TREN 1 to 3 — Tracking enable signal
3)	PULSER connector	Input connector of the Manual pulse generator/Incremental synchronous encoder.
4)	Module loading lever	Used to load the module to the base unit.
5)	Module fixing screw hole	Hole for the screw used to fix to the base unit (M3×12 screw : Purchase from the other supplier)
6)	Module fixing hook	Hook used to fix to the base unit.

(2) Performance specifications

(a) Tracking enable signal input

Item		Specifications
Number of inputs		Tracking enable signal : 3 points
Input method		Sink/Source type
Isolation method		Photocoupler
Rated input voltage		12/24VDC
Rated input current		12VDC 2mA/24VDC 4mA
Operating voltage range		10.2 to 26.4VDC (12/24VDC +10/ -15%, ripple ratio 5% or less)
ON voltage/current		10VDC or more/2.0mA or more
OFF voltage/current		1.8VDC or less/0.18mA or less
Input resistance		Approx. 5.6KΩ
Response time	OFF to ON	0.4ms/0.6ms/1ms (CPU parameter setting, Default 0.4ms)
	ON to OFF	
Common terminal arrangement		1 point/common(Common contact: TREN.COM)
Indicates to display		ON indication(LED)

(b) Manual pulse generator/Incremental synchronous encoder input

Item		Specifications
Number of modules		3/module
Voltage-output/ Open collector type	High-voltage	3.0 to 5.25VDC
	Low-voltage	0 to 1.0VDC
Differential-output type (26LS31 or equivalent)	High-voltage	2.0 to 5.25VDC
	Low-voltage	0 to 0.8VDC
Input frequency		Max. 200kpps (After magnification by 4)
Applicable types		Voltage-output type/Open-collector type (5VDC), Recommended product: MR-HDP01 Differential-output type: (26LS31 or equivalent) Selectable by connector wiring
External connector type		40 pin connector
Applicable wire size		$0.3mm^2$
Applicable connector for the external connection		A6CON1(Attachment) A6CON2, A6CON3(Optional)
Applicable connector/ Terminal block converter module		A6TBXY36, A6TBXY54, A6TBXY70(Optional)
Cable length	Voltage-output/ Open collector type	30m (98.36ft.) (Open collector type: 10m (32.79ft.))
	Differential-output type	
Number of I/O occupying points		32 points(I/O allocation: Intelligent, 32 points)
Internal current consumption(5VDC)[A]		0.11
Exterior dimensions[mm(inch)]		98(H)×27.4(W)×89.3(D) (3.86(H)×1.08(W)×3.52(D))
Weight [kg]		0.15

(3) Connection of manual pulse generator

Manual pulse generators are available in voltage output/open collector type and differential output type. Since these types differ in connection method, design according to the connection method of section 2.4.6 (5).
In addition the usable numbers of manual pulse generator which can be used with each CPU modules are max. 3 modules.

Motion CPU module	Manual pulse generator
Q173CPU(N)	Max. 3 modules (Q173PX: Max. 1 module)
Q172CPU(N)	

(4) Connection of incremental synchronous encoder

Incremental synchronous encoders are available in voltage output/Open collector type and differential output type. Since these types differ in connection method, design according to the connection method of section 2.4.6 (5).
Serial type absolute synchronous encoder (MR-HENC) not connected to Q173PX. Then connect to Q172EX.
In addition, the usable numbers of synchronous encoders differ depending on the modules.
The following number of serial absolute synchronous encoders and incremental synchronous encoders combined can be used.

Motion CPU module	Synchronous encoder
Q173CPU(N)	Max. 12 modules (Q173PX: Max. 4 modules)
Q172CPU(N)	Max. 8 modules (Q173PX: Max. 3 modules)

- Tracking enable signal

  Tracking enable signal of Q173PX is used to start the input from incremental synchronous encoders.
  The external input signal of the incremental synchronous encoder is indicated below.
  This signal is used as the input start signal or high-speed reading function from incremental synchronous encoder.

External input signal of the incremental synchronous encoder	Item	Number of points on one Q173PX
Tracking enable signal input	High-speed readings function	Each 1 point (Total 3 points)

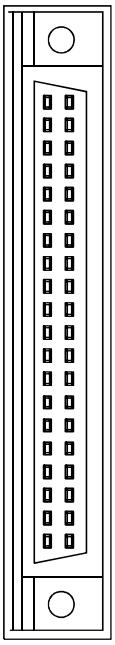
(5) Connection of manual pulse generator interface module

(a) The pin layout of the PULSER connector

Use the PULSER connector at the Q173PX module front to connect the manual pulse signals, incremental synchronous encoder signals.

The following pin layout of the Q173PX PULSER connector viewed from the front.

The pin layout and connection description of the PULSER connector are described below.



PULSER connector

	Pin No.	Signal Name	Pin No.	Signal Name	
2)	B20	HB1	A20	HA1	2)
	B19	SG	A19	SG	
	B18	5V	A18	HPSEL1	1)
3)	B17	HA1N	A17	HA1P	3)
	B16	HB1N	A16	HB1P	
2)	B15	HB2	A15	HA2	2)
	B14	SG	A14	SG	
	B13	5V	A13	HPSEL2	1)
3)	B12	HA2N	A12	HA2P	3)
	B11	HB2N	A11	HB2P	
2)	B10	HB3	A10	HA3	2)
	B9	SG	A9	SG	
	B8	5V	A8	HPSEL3	1)
3)	B7	HA3N	A7	HA3P	3)
	B6	HB3N	A6	HB3P	
	B5	No connect	A5	No connect	
	B4	TREN1 −	A4	TREN1 +	
	B3	TREN2 −	A3	TREN2 +	
	B2	TREN3 −	A2	TREN3 +	
4)	B1	FG	A1	FG	4)

Applicable connector model name

A6CON1 type soldering type connector
FCN-361J040-AU connector (FUJITSU TAKAMISAWA COMPONENT LIMITED)
FCN-360C040-B connector cover
} (attachment)

A6CON2 type Crimp-contact type connector
A6CON3 type Pressure-displacement type connector
} (Optional)

1) : Input type from manual pulse generator/incremental synchronous encoder switched by HPSEL□.
Not connection : Voltage-output type/open collector type.
HPSEL□-SG connection : Diffrential-output type.
(Switching is possible for each input 1 to 3)

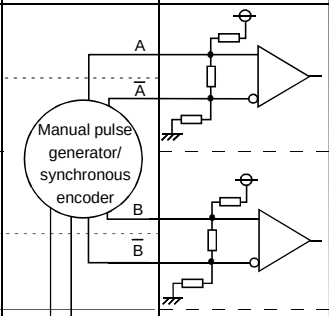
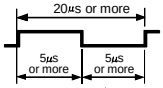
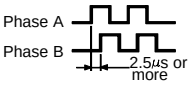
2) : Voltage output/open collector type
Connect the A-phase signal to HA1P/HA2P/HA3P, and the B-phase signal to HB1P/HB2P/HB3P.

3) : Differential output type
Connect the A-phase signal to HA1P/HA2P/HA3P, and the A-phase inverse signal to HA1N/HA2N/HA3N.
Connect the B-phase signal to HB1P/HB2P/HB3P, and the B-phase inverse signal to HB1N/HB2N/HB3N.

4) : Connect the shield cable between manual pulse generator /incremental synchronos encoder and Q173PX at the FG signal.

(b) Interface between PULSER connector and manual pulse generator(Differential output type)/Incremental synchronous encoder

Interface between Manual pulse generator(Differential output type)/ Incremental synchronous encoder

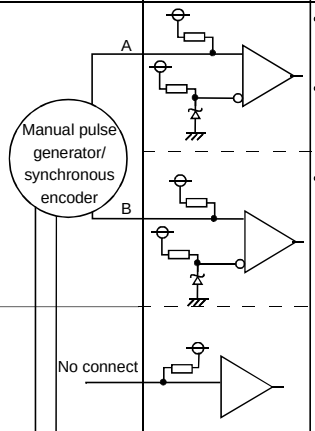
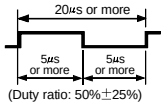
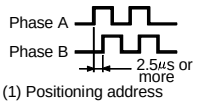
Input or Output	Signal name		Pin No. PULSER connector Voltage-Output type 1	2	3	Wiring example	Internal circuit	Specification	Description
Input	Manual pulse generator, phase A	A+ HA□P	A17	A12	A7			• Rated input voltage 5.5VDC or less • HIGH level 2.0 to 5.25VDC • LOW level 0.8VDC or less • 26LS31 or equivalent	For connection manual pulse generator Phases A, B • Pulse width  (Duty ratio: 50%±25%) • Rise, fall time •••1μs or less. • Phase difference  (1) Positioning address increses if Phase A leads Phase B. (2) Positioning address decreses if Phase B leads Phase A.
		A− HA□N	B17	B12	B7				
	Manual pulse generator, phase B	B+ HB□P	A16	A11	A6				
		B− HB□N	B16	B11	B6				
	Select type signal HPSEL□		A18	A13	A8				
Power supply	P5(Note-1)		B18	B13	B8				
	SG		A19 B19	A14 B14	A9 B9				

(Note-1) : The 5V(P5)DC power supply from the Q173PX must not be connected if a separated power supply is used as the Manual pulse generator/Incremental synchronous encoder power supply. Use a 5V stabilized power supply as a separated power supply. Any other power supply may cause a failure.

(Note-2) : When used to the Manual pulse generator(differential-output type)/Incremental synchronous encoder, connection of HPSEL□ and SG.

(c) Interface between PULSER connector and manual pulse generator (Voltage output/Open collector type)/ Incremental synchronous encoder.

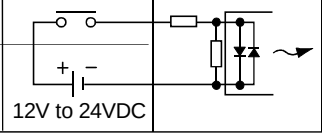
Interface between Manual pulse generator(Voltage-output/Open collector type)/Incremental synchronous encoder

Input or Output	Signal name	Pin No. PULSER connector Voltage-Output type 1	2	3	Wiring example	Internal circuit	Specification	Description
Input	Manual pulse generator, phase A HA□	A20	A15	A10			• Rated input voltage 5.5VDC or less • HIGH level 3 to 5.25VDC/ 2mA or less • LOW level 1VDC or less/ 5mA or more	For connection manual pulse generator Phases A, B • Pulse width  (Duty ratio: 50%±25%) • Rise, fall time •••1μs or less • Phase difference  (1) Positioning address increses if Phase A leads Phase B. (2) Positioning address decreses if Phase B leads Phase A.
	Manual pulse generator, phase B HB□	B20	B15	B10				
	Select type signal HPSEL□	A18	A13	A8				
Power supply	P5(Note)	B18	B13	B8				
	SG	A19 B19	A14 B14	A9 B9				

(Note) : The 5V(P5)DC power supply from the Q173PX must not be connected if a separated power supply is used as the Manual pulse generator/Incremental synchronous encoder power supply.
Use a 5V stabilized power supply as a separated power supply. Any other power supply may cause a failure.

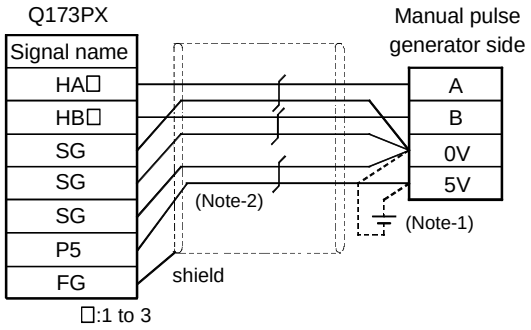
(d) Interface between PULSER connector and tracking enable signal

Interface between tracking enable signal

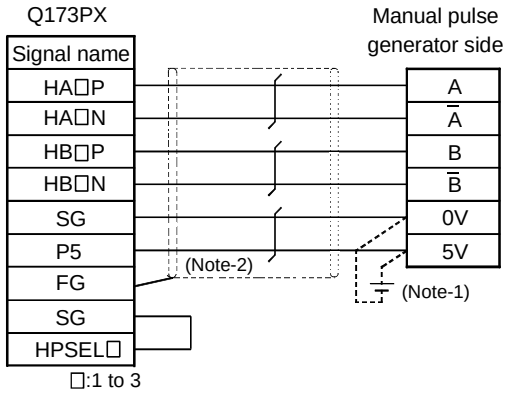
Input or Output	Signal name		Pin No. PULSER connector 1	2	3	Wiring example	Internal circuit	Specification	Description
Input	Tracking enable	TREN□+	A4	A3	A2				Tracking enable signal input.
		TREN□−	B4	B3	B2				

(6) Connection examples of manual pulse generator

Connection of manual pulse generator
(Voltage-output/Open collector type)



Connection of manual pulse generator
(Differential-output type)



(Note-1) : The 5VDC(P5) power supply from the Q173PX must not be connected if a separate power supply is used as the Manual pulse generator/Incremental synchronous encoder power supply.
If a separate power supply is used as the manual pulse generator power supply, use a 5V stabilized power supply.
Any other power supply may cause a failure.

(Note-2) : Connect HPSEL □ to the SG terminal if a separate power supply is used as the manual pulse generator/Incremental synchronous encoder power supply.

⚠ CAUTION

- If a separate power supply is used as the manual pulse generator/incremental synchronous encoder power supply, use a 5V stabilized power supply. Any other power supply may cause a failure.

2.4.7 Manual pulse generator/Serial absolute synchronous encoder

(1) Table of the Manual pulse generator specifications

Item	Specifications
Model name	MR-HDP01
Pulse resolution	25PLS/rev(100 PLS/rev after magnification by 4)
Output method	Voltage-output(power supply voltage -1V or more), Output current = Max. 20mA
Power supply voltage	4.5 to 13.2VDC
Current consumption	60mA
Life time	100 revolutions (at 200r/min)
Permitted axial loads	Radial load : Max. 19.6N
	Thrust load : Max. 9.8N
Operation temperature	-10 to 60°C(14 to 140°F)
Weight [kg(lb)]	0.4(0.88)
Number of max. revolution	Instantaneous Max. 600r/min. normal 200r/min
Pulse signal status	2 signals : A phase, B : phase, 90° phase difference
Friction torque	0.1N/m(at 20°C (68°F))

(2) Table of the Serial absolute synchronous encoder specifications

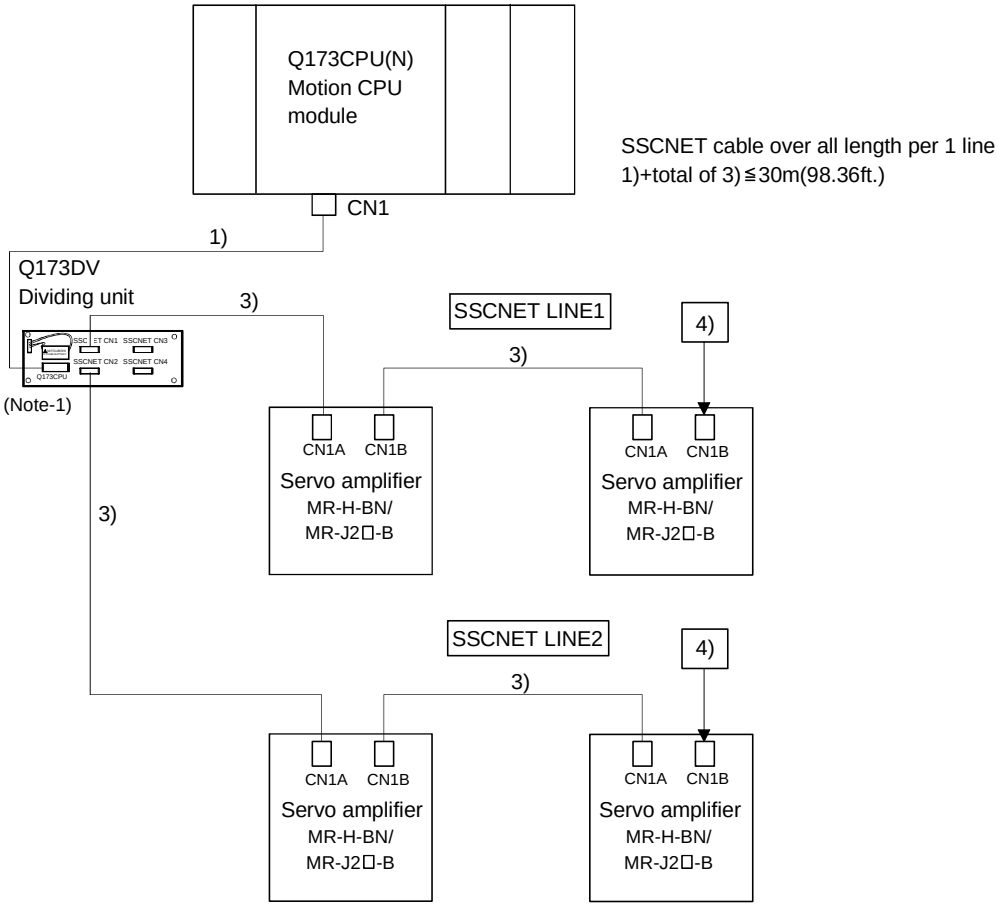
Item	Specifications
Model name	MR-HENC
Resolution	16384PLS/rev
Transmission method	Serial communications(connected to Q172EX)
Direction of increasing addresses	CCW(viewed from end of shaft)
Protective construction	Dust-proof, Oil-proof(IP52)
Permitted speed	4300r/min
Permitted axial loads	Radial load : Max. 98N
	Thrust load : Max. 49N
Runout at input shaft tip	0.02mm(0.00079 inch) or less, 15mm(0.59 inch) from tip
Recommended coupling	Bellows coupling
Permitted angular acceleration	40000rad/s^2
Operation temperature	-5 to 55°C(23 to 131°F)
Internal current consumption	0.15A
Weight [kg(lb)]	1.5 (3.3)
Connecting cable	MR-JHSCBL□M-H □=Cable length : 2m(6.56ft.), 5m(16.4ft.), 10m(32.8ft.), 20m(65.6ft.), 30m(98.4ft.)
Communications method	Differential driver/receiver conforming to RS422A
Transmission distance	Max. 30m(98.4ft.)

2.4.8 Connection method with SSCNET cables and termination connector

This section explains how to connect between Motion CPU module and servo amplifiers. Connected between the Motion CPU module and servo amplifiers by the SSCNET. When using the Q172CPU(N), can be used only one SSCNET line for connection to servo amplifier(Connect to CN1). The Q173CPU(N) can be used up to four SSCNET lines for servo amplifier connection(Connect to CN1). One SSCNET line allows connection of up to eight servo amplifies.
Also, SSCNET cables or termination connector are different depending on the servo amplifiers.

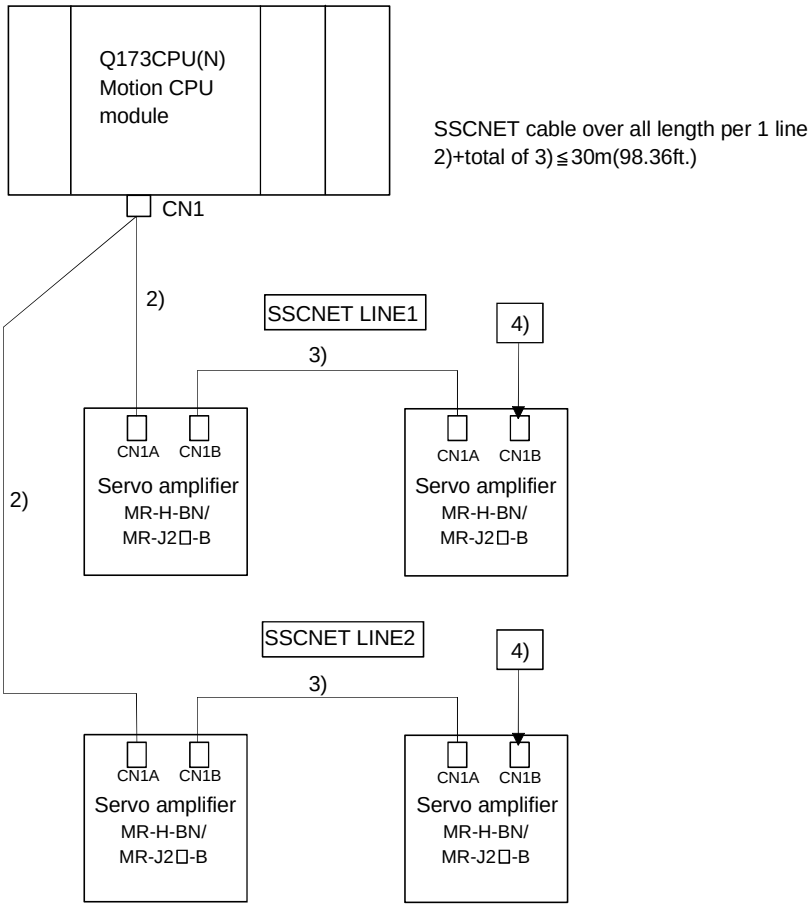
(1) Connection between Q173CPU(N) and servo amplifiers

(a) When using the Dividing unit/external battery



(Note-1) : When using the external battery, set the Battery (A6BAT/MR-BAT) into the Dividing unit (Q173DV).

(b) When using the Dividing cable

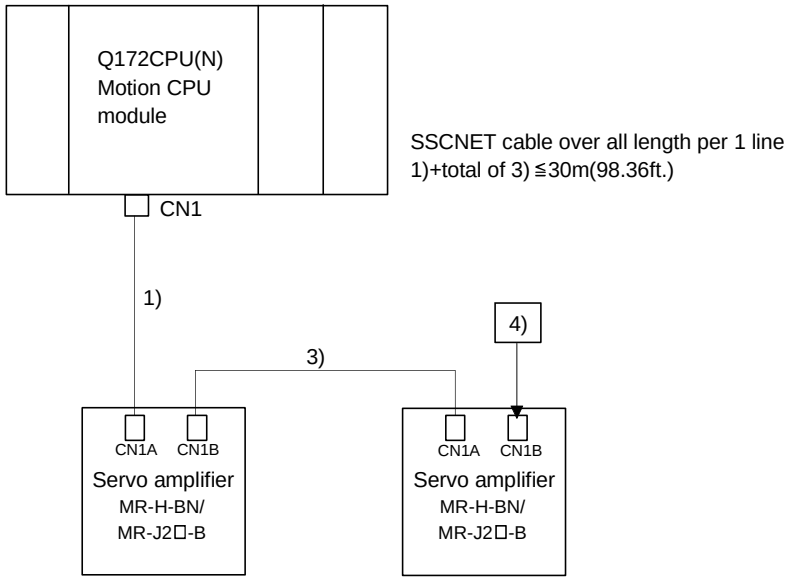


No.	Part name	Model name	Description
1)	Motion CPU to Dividing unit SSCNET cable	Q173DVCBL□M(Note-2)	• Connection between Q173CPU(N) and Q173DV 0.5m(1.64ft.), 1m(3.28ft.)
2)	Motion CPU to servo amplifier SSCNET cable (Note-1)	Q173J2B△CBL□M(Note-2),(Note-3)	• Connection between Q173CPU(N) and the first MR-J2□-B 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
		Q173HB△CBL□M(Note-2),(Note-3)	• Connection between Q173CPU(N) and the first MR-H-BN 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
3)	Servo amplifier/Dividing unit to servo amplifier SSCNET cable	MR-J2HBUS□M(Note-2)	• Connection between MR-J2□-B and MR-J2□-B • Connection between Q173DV and MR-J2□-B 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
		MR-J2HBUS□M-A(Note-2)	• Connection between Q173DV and MR-H-BN • Connection between MR-H-BN and MR-J2□-B 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
		MR-HBUS□M(Note-2)	• Connection between MR-H-BN and MR-H-BN 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
4)	Termination connector	MR-TM	• Connected to the last MR-H-BN by SSCNET
		MR-A-TM	• Connected to the last MR-J2□-B by SSCNET

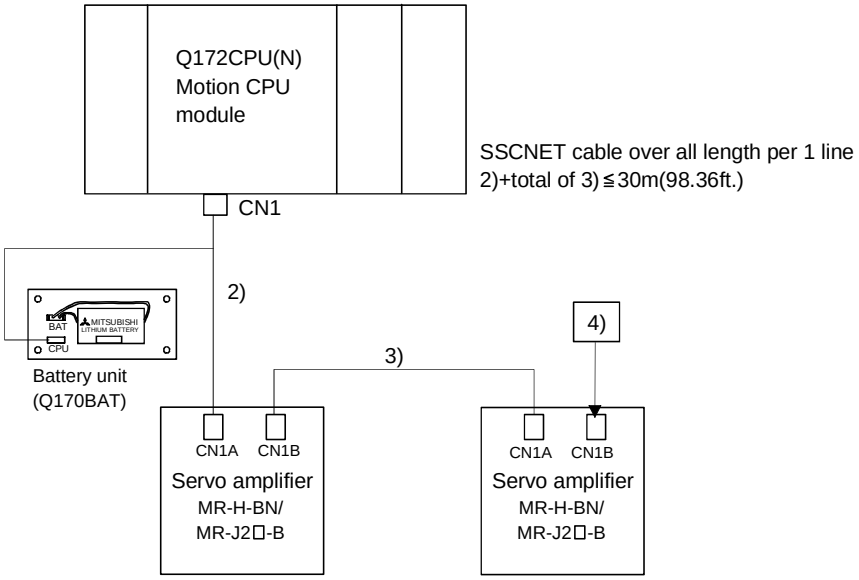
(Note-1) : Branch from a connector on the Q173CPU(N) side according to the number of lines.
(Note-2) : □=cable length
(Note-3) : △=SSCNET LINE No.(none(LINE1), 2(LINE1/2), 3(LINE1/2/3), 4(LINE1/2/3/4))

(2) Connection between Q172CPU(N) and servo amplifiers

(a) When not using the external battery



(b) When using the external battery



No.	Part name	Model name	Description
1)	Motion CPU to servo amplifier SSCNET cable	Q172J2BCBL□M(Note-1)	• Connection between Q172CPU(N) and MR-J2□-B 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
		Q172HBCBL□M(Note-1)	• Connection between Q172CPU(N) and MR-H-BN 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
2)	Motion CPU to servo amplifier SSCNET cable (For connection of the Battery module)	Q172J2BCBL□M-B(Note-1)	• Connection between Q172CPU(N) and MR-J2□-B, Q170BA 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
		Q172HBCBL□M-B(Note-1)	• Connection between Q172CPU(N) and MR-H-BN, Q170BAT 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
3)	Servo amplifier to servo amplifier SSCNET cable	MR-J2HBUS□M(Note-1)	• Connection between MR-J2□-B and MR-J2□-B 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
		MR-J2HBUS□M-A(Note-1)	• Connection between MR-H-BN and MR-J2□-B 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
		MR-HBUS□M(Note-1)	• Connection between MR-H-BN and MR-H-BN 0.5m(1.64ft.), 1m(3.28ft.), 5m(16.4ft.)
4)	Termination connector	MR-TM	• Connected to the last MR-H-BN by SSCNET
		MR-A-TM	• Connected to the last MR-J2□-B by SSCNET

(Note-1) : □=cable length

(3) Cable specifications

(a) Q172J2BCBL□M (-B)

Item \ Model name	Q172J2BCBL05M(-B)	Q172J2BCBL1M(-B)	Q172J2BCBL5M(-B)
Cable length [m(ft.)]	0.5(1.64)	1(3.28)	5(16.4)

(b) Q172HBCBL□M (-B)

Item \ Model name	Q172HBCBL05M(-B)	Q172HBCBL1M(-B)	Q172HBCBL5M(-B)
Cable length [m(ft.)]	0.5(1.64)	1(3.28)	5(16.4)

(c) Q173J2B△CBL□M

Item \ Model name	Q173J2B△CBL05M	Q173J2B△CBL1M	Q173J2B△CBL5M
Cable length [m(ft.)]	0.5(1.64)	1(3.28)	5(16.4)

△= SSCNET LINE No. : none(LINE 1), 2(LINE 2), 3(LINE 3), 4(LINE 4)

(d) Q173HB△CBL□M

Item \ Model name	Q173HB△CBL05M	Q173HB△CBL1M	Q173HB△CBL5M
Cable length [m(ft.)]	0.5(1.64)	1(3.28)	5(16.4)

△= SSCNET LINE No. : none(LINE 1), 2(LINE 2), 3(LINE 3), 4(LINE 4)

(e) Q173DVCBL□M

Item \ Model name	Q173DVCBL05M	Q173DVCBL1M
Cable length [m(ft.)]	0.5(1.64)	1(3.28)

(f) MR-HBUS□M

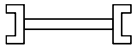
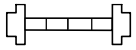
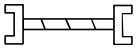
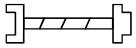
Item \ Model name	MR-HBUS05M	MR-HBUS1M	MR-HBUS5M
Cable length [m(ft.)]	0.5(1.64)	1(3.28)	5(16.4)

(g) MR-J2HBUS□M (-A)

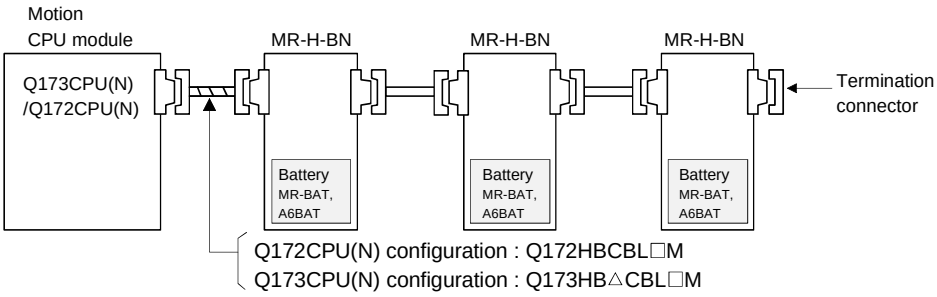
Item \ Model name	MR-J2HBUS05M(-A)	MR-J2HBUS1M(-A)	MR-J2HBUS5M(-A)
Cable length [m(ft.)]	0.5(1.64)	1(3.28)	5(16.4)

(4) Connection example with servo amplifiers

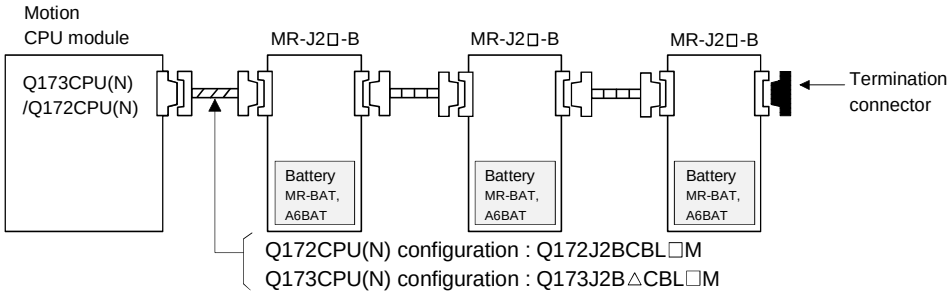
As the SSCNET cables or termination connector is different depending on the servo amplifiers, refer to the following connection example.
The SSCNET cables and termination connector used in the connection example are any of the models shown in the following table.
When absolute position detection control is executed, installed battery(MR-BAT/A6BAT) to servo amplifier.

Part name	Model name	Depiction in connection example
Servo amplifier to servo amplifier SSCNET cable	MR-HBUS□M	
	MR-J2HBUS□M	
	MR-J2HBUS□M-A	
Motion CPU to servo amplifier SSCNET cable	Q173HB△CBL□M/ Q172HBCBL□M(-B)	
	Q173J2B△CBL□M/ Q172J2BCBL□M(-B)	
Motion CPU to Dividing unit SSCNET cable	Q173DVCBL□M	
Termination connector	MR-TM	
	MR-A-TM	

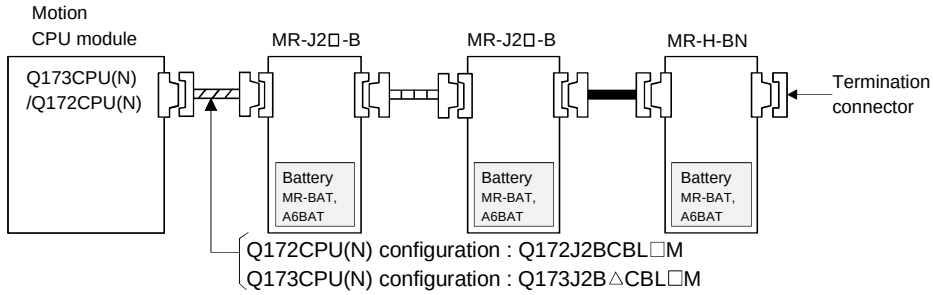
(a) MR-H-BN configuration

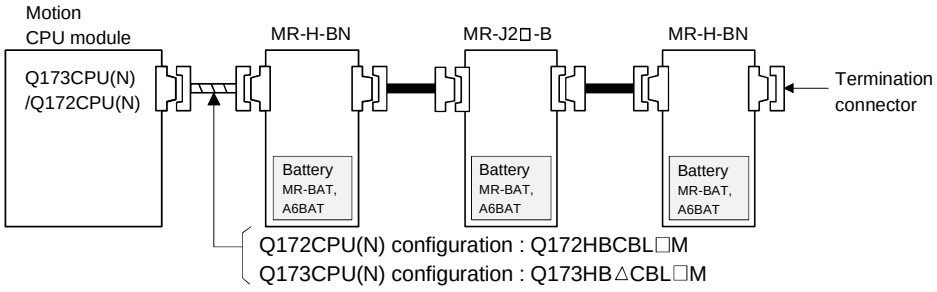


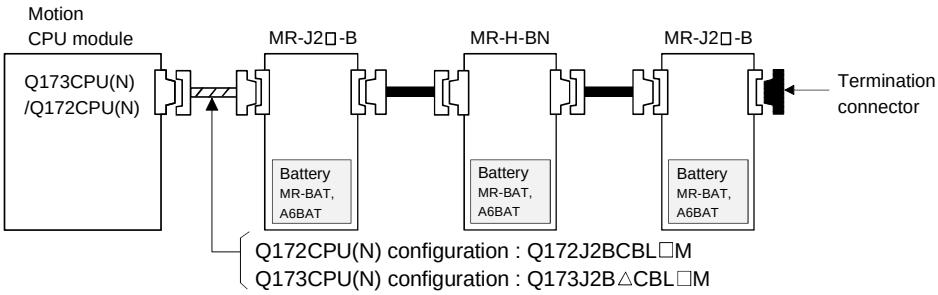
(b) MR-J2□-B configuration



(c) MR-J2□-B/MR-H-BN configuration





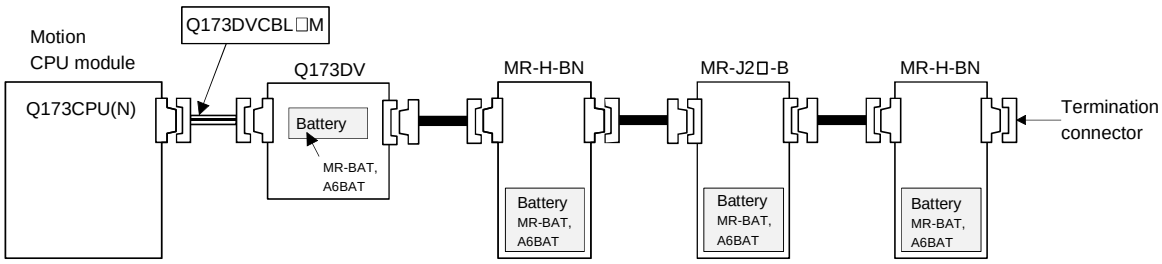


(d) When using the external battery

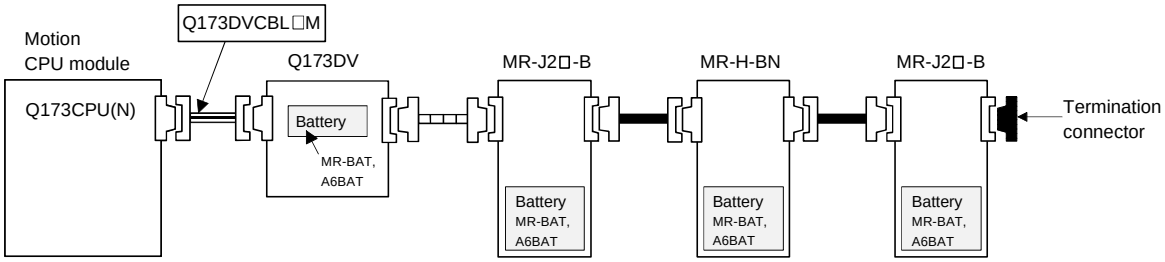
As the SSCNET cable used depend on the servo amplifiers, when using the external battery, refer to the following connection example.

1) Example of Q173CPU(N)

• MR-H-BN + MR-J2□-B + MR-H-BN configuration

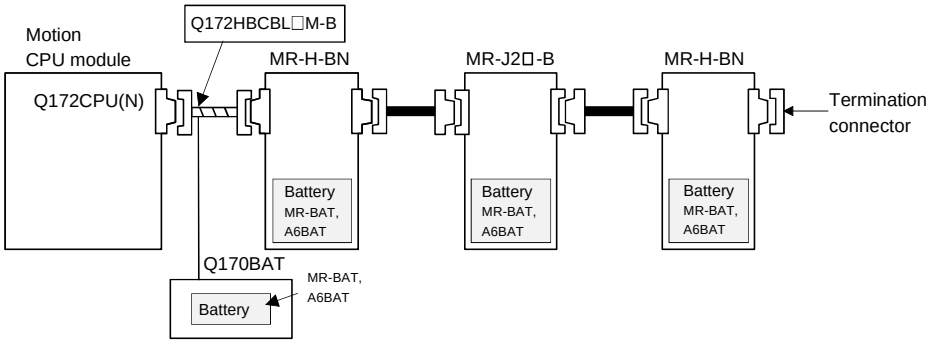


• MR-J2□-B + MR-H-BN + MR-J2□-B configuration

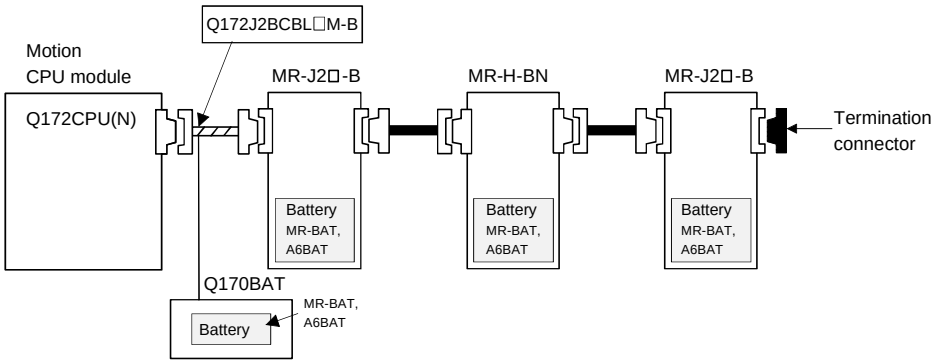


2) Example of Q172CPU(N)

• MR-H-BN + MR-J2□-B + MR-H-BN configuration



• MR-J2□-B + MR-H-BN + MR-J2□-B configuration



(5) Setting of the servo amplifier axis numbers(dno.) and axis No.

The axis No.s are used to set the axis numbers of the SSCNET connected servo amplifiers in the program. Axis No.s 1 to 32 can be set for the Q173CPU(N), 1 to 8 for the Q172CPU(N). To set the axis No.s, assign the axis No.s to the axis numbers(dno.) set with the axis selection switches(rotary switch) of the servo amplifiers(Positions 0 to 7 of the rotary switch correspond to d1 to d8 on the system settings screen.) to each SSCNET line in the system settings of the positioning software package.

You cannot set the same axis number(dno.) and axis No.(dno.) more than once.

Correspondences between dno.s and rotary switches of servo amplifier

dno. (Note)	SSCNET LINE	Servo amplifier's rotary switch
1	1	"0"
2	1	"1"
3	1	"2"
4	1	"3"
5	1	"4"
6	1	"5"
7	1	"6"
8	1	"7"

dno. (Note)	SSCNET LINE	Servo amplifier's rotary switch
1	2	"0"
2	2	"1"
3	2	"2"
4	2	"3"
5	2	"4"
6	2	"5"
7	2	"6"
8	2	"7"

dno.(Note)	SSCNET LINE	Servo amplifier's rotary switch
1	3	"0"
2	3	"1"
3	3	"2"
4	3	"3"
5	3	"4"
6	3	"5"
7	3	"6"
8	3	"7"

dno. (Note)	SSCNET LINE	Servo amplifier's rotary switch
1	4	"0"
2	4	"1"
3	4	"2"
4	4	"3"
5	4	"4"
6	4	"5"
7	4	"6"
8	4	"7"

(Note) : dno. is the servo amplifier axis numbers displayed in the system settings of the positioning software package. Set the axis No. relative to the dno. in system settings.

The Dividing unit (Q173DV) and the SSCNET cables (Q173J2B△CBL□M/ Q173HB△CBL□M) between the Motion CPU and servo amplifiers divide signals allocated in CN1 of the Q173CPU(N) into each of the four lines. The following table shows correspondence between the connector No. after the division and the SSCNET line No. .

Correspondences between SSCNET LINE No. and connector No.

SSCNET LINE No.	Connector No. of the Dividing unit	Connector No. of the SSCNET cable
1	SSCNET CN1	1
2	SSCNET CN2	2
3	SSCNET CN3	3
4	SSCNET CN4	4

(Note) : SSCNET LINE No. Q173CPU(N) : 4 lines / Q172CPU(N) : 1 line.

2.4.9 External battery

This section describes the battery specifications which used Motion CPU, handling precautions and equipments.

(1) External battery specifications(For Motion CPU module)

Item \ Model name	A6BAT/MR-BAT
Classification	Manganese dioxide lithium primary battery
Normal voltage [V]	3.6
Battery discharge capacity [mAh]	1600
Battery warranty period	5 years
Applications	Continuous power off (For IC-RAM back-up of the Q173CPU(N)/Q172CPU(N))
Exterior dimensions [mm(inch)]	ϕ16×30

(2) Q173CPU(N)/Q172CPU(N) back-up by the external battery.

When using the external battery, set the external battery(A6BAT/MR-BAT) in the system settings.

Item		Guaranteed time (MIN) [h]	Actual time(TYP) [h]
Continuous power off time	External battery use	60000	240000

(3) External battery and SSCNET cable

When using the external battery, install A6BAT/MR-BAT to the Dividing unit or Battery unit. Also be sure the following cables.

Item	Installation location of the external battery	SSCNET cable
Q173CPU(N)	Q173DV	Q173DVCBL□M
Q172CPU(N)	Q170BAT	Q172J2BCBL□M-B (For MR-J2□-B)/ Q172HBCBL□M-B (For MR-H-BN)

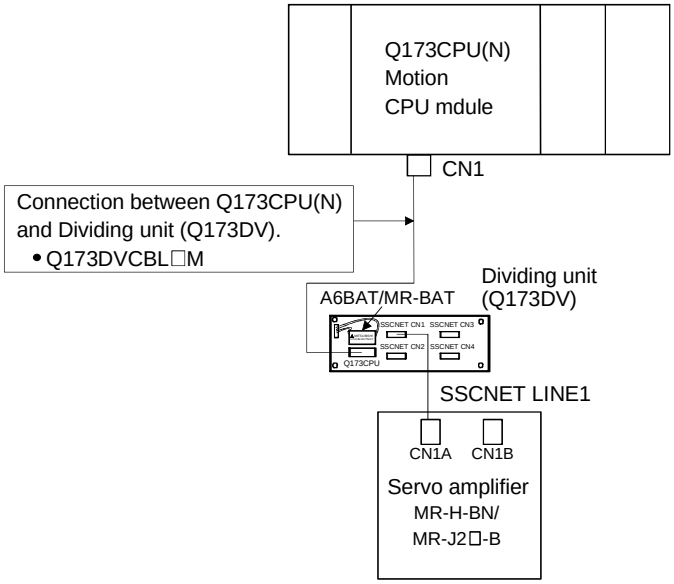
⚠ CAUTION

- Do not shot a battery.
- Do not disassemble a battery.
- Do not burn a battery.
- Do not overheat a battery.
- Do not solder the battery terminal.
- When using the external battery, be sure to select " the external battery use " in the system settings. If not setting the external battery, the back-up data of Motion CPU, may not back up, since the battery voltage detection error is not detected.

(a) Connection with Q173CPU(N)

Connection procedure of Q173CPU(N) and A6BAT/MR-BAT

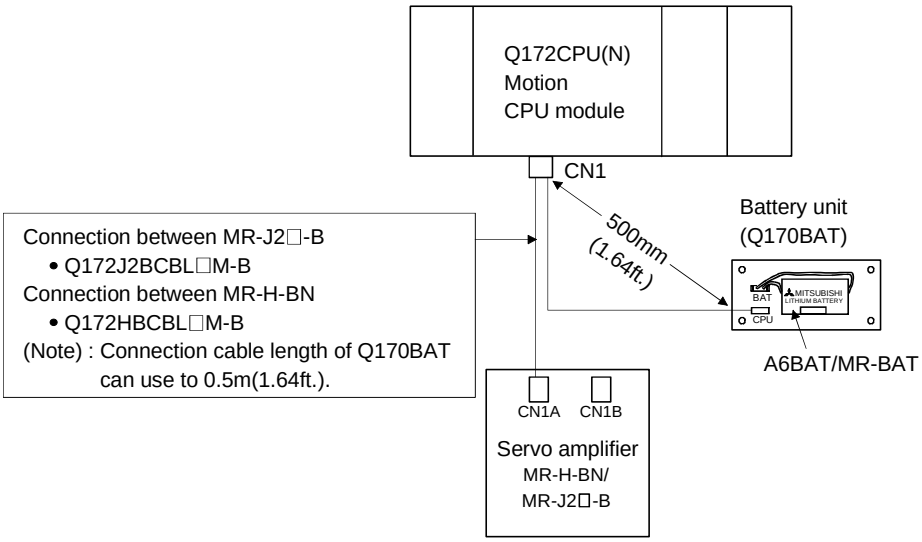
1) Set the A6BAT/MR-BAT to the Dividing unit(Q173DV)
2) Connect the A6BAT/MR-BAT connector to the BAT connector of the Q173DV.
3) Connect between Q173CPU(N) and Q173DV by the SSCNET cable (Q173DVCBL□M)



(b) Connection with Q172CPU(N)

Connection procedure of Q172CPU(N) and A6BAT/MR-BAT

1) Set the A6BAT/MR-BAT to the Battery unit (Q170BAT).
2) Connect the A6BAT/MR-BAT connector to the BAT connector of the Q170BAT.
3) Connect between Q172CPU(N) and Q170BAT by the SSCNET cable.



2.4.10 Cooling fan unit (Q170FAN) (Q173CPU/Q172CPU only)

This section explains the specifications of the Cooling fan unit(Q170FAN) used for the Motion CPU module.

(1) Removable conditions of the Cooling fan unit

It is possible to remove the Cooling fan unit (Q170FAN) in order to disperse heat from inside the Motion CPU module according to the number of Motion CPU module and ambient temperature conditions.
Removable/Not removable of the Cooling fan unit (Q170FAN) by number of Motion CPU module and ambient temperature is as follows.

(a) When using only one Motion CPU module

It is possible to remove the Cooling fan unit if the ambient temperature in which the Motion CPU module will be operating is 0 to 40°C (32 to 104°F) .

(b) When using two or more Motion CPU module

Do not remove the Cooling fan unit(Q170FAN).

Ambient temperature of the Motion CPU / Number of the Motion CPU	0 to 40°C (32 to 104°F)	Over 40 to 55°C (Over 104 to 131°F)
1 module	Removable	Not removable
2 modules or more	Not removable	

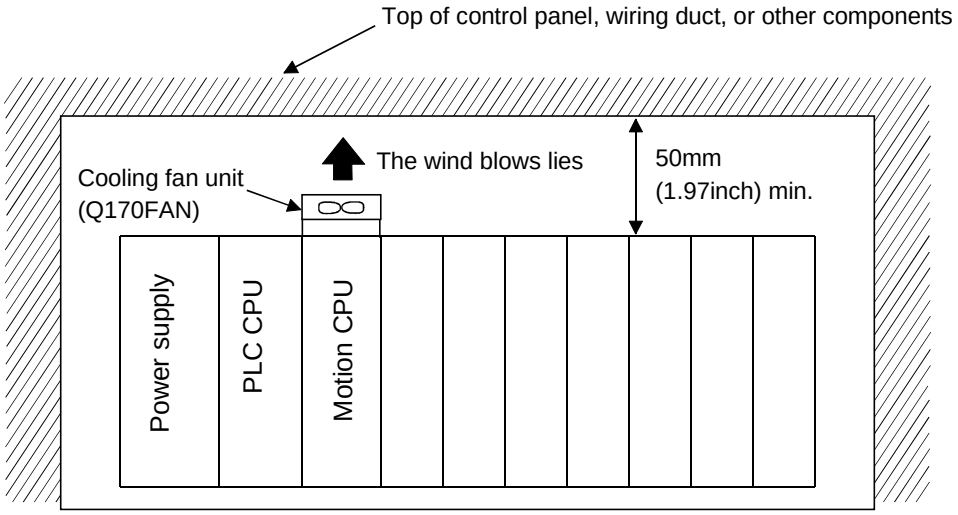
(2) Cooling fan unit specifications

Item \ Model name	Q170FAN
Type	Cooling fan
Operating ambient Temperature °C (°F)	0 to 70 (32 to 158)
Operating voltage range [V]	4.3 to 5.8
Rated current [A]	0.08
Rated rotational speed [r/min]	7500
Service life time	30000 hours rated voltage continuous operation (at 40°C (104°F))
Application	For cooling Motion CPU module
Weight [kg]	0.01

As a guideline for preventive maintenance, the module should be inspected every six months and replaced approximately every two to three years even if the accumulated number of operating hours is less than the service life time shown above (Refer to section 6.3 Periodic Inspections.)

(3) In point of the layout design within the control panel

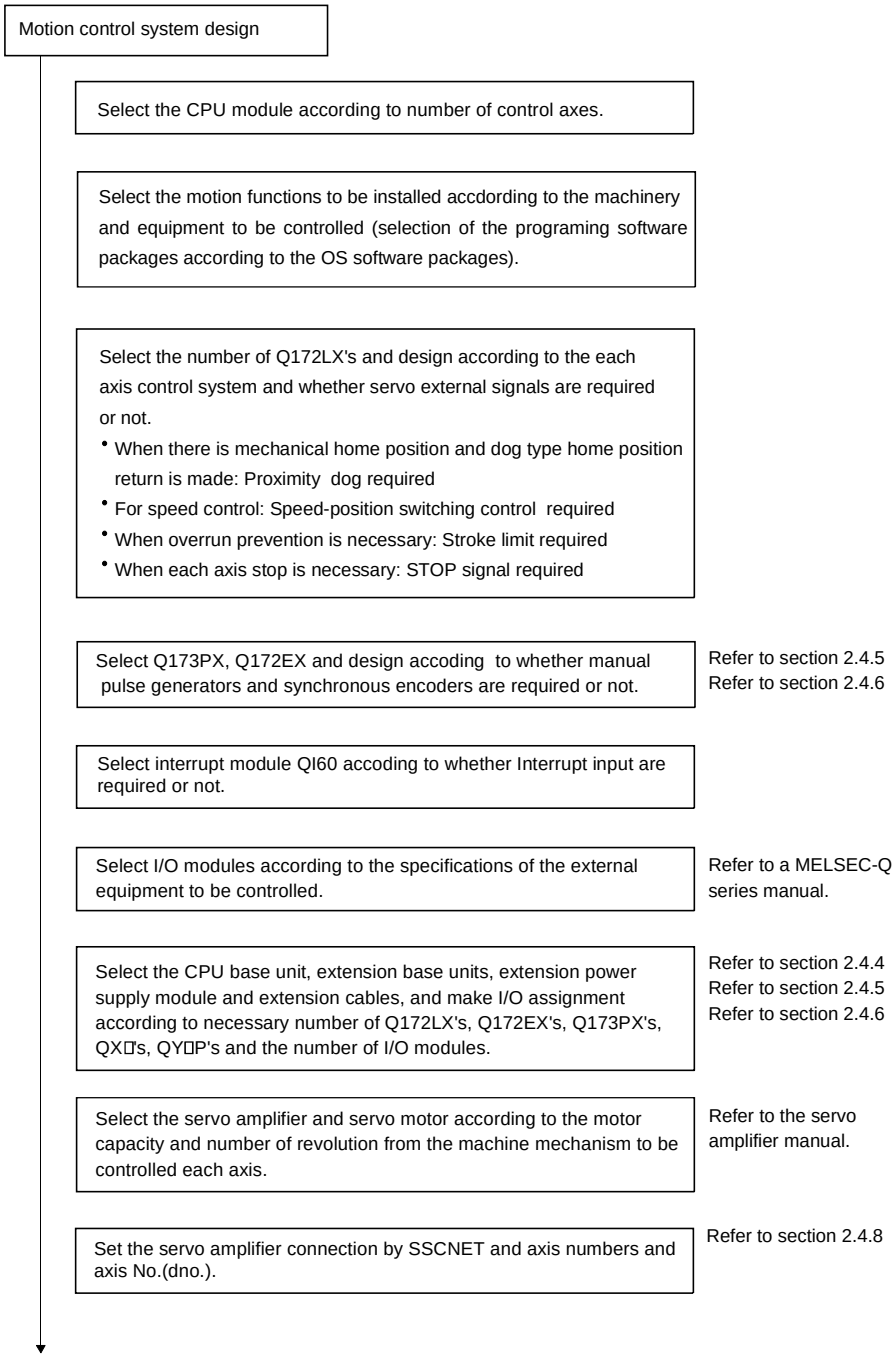
Leave 50mm(1.97inch) or more clearance between the top of the modules and structures or parts.

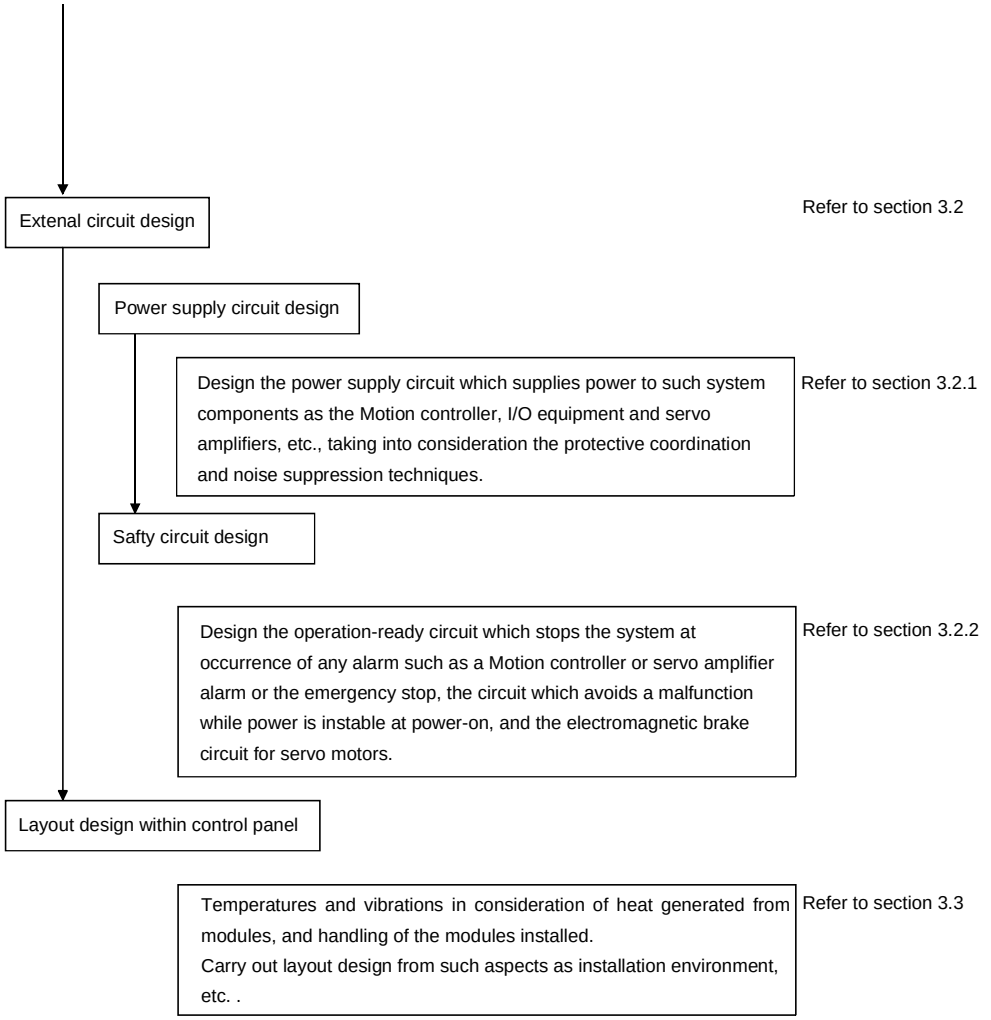


3. DESIGN

3.1 System Designing Procedure

Design the system which uses the Multiple CPU system in the following procedure.





⚠ CAUTION

- Provide appropriate circuits external to the Motion CPU to prevent cases where danger may result from abnormal operation of the overall system in the event of a power supply fault or Motion CPU failure.
- Install the Motion controller, servo amplifier, servomotor, and regenerative resistor on inflammable material. Direct installation on flammable material or near flammable material may lead to fires.
- If a fault occurs in the Motion controller or servo amplifier, shut the power OFF at the servo amplifier's power source. If a large current continues to flow, fires may occur.
- When using a regenerative resistor, shut the power OFF with an error signal. The regenerative resistor may abnormally overheat due to a fault in the regenerative transistor, etc., and may lead to fires.
- Always take heat measures such as flame proofing for the inside of the control panel where the servo amplifier or regenerative resistor is installed and for the wires used. Failing to do so may lead to fires.
- Do not apply a voltage other than that specified in the instruction manual on any terminal. Doing so may lead to destruction or damage.
- Do not mistake the polarity (+ / -), as this may lead to destruction or damage.

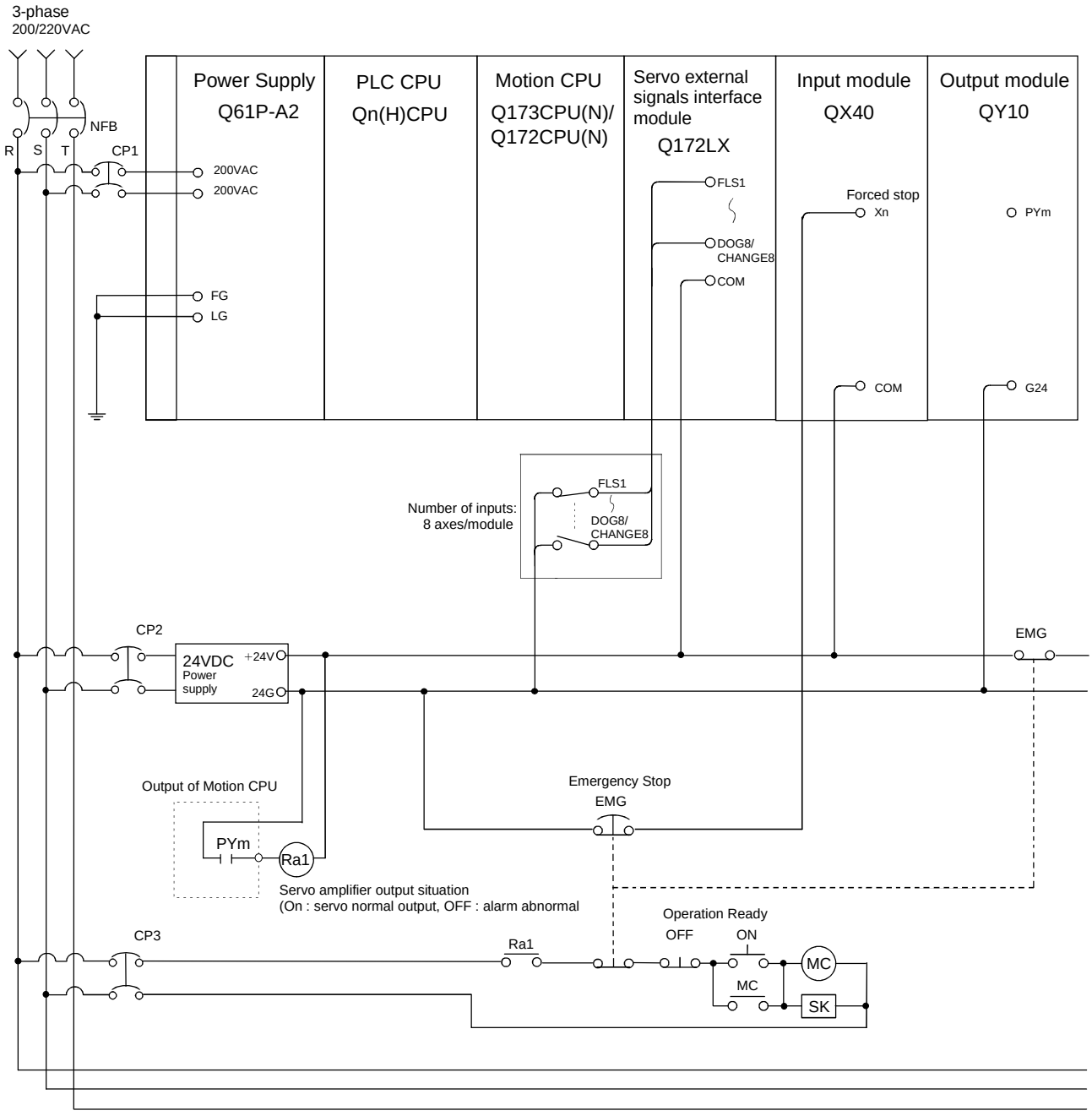
⚠ CAUTION

- Do not touch the servo amplifier's heat radiating fins, regenerative resistor and servomotor, etc. while the power is ON and for a short time after the power is turned OFF. In this timing, these parts become very hot and may head to burns.
- Always turn the power OFF before touching the servomotor shaft or coupled machines, as these parts may lead to injuries.
- Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.
- Always install a leakage breaker on the Motion controller and servo amplifier power source.
- If installation of a magnetic contactor for power shut off during an error, etc., is specified in the instruction manual for the servo amplifier, etc., always install the magnetic contactor.
- Install an emergency stop circuit externally so that the operation can be stopped immediately and the power shat off.
- Use the Motion controller, servo amplifier, servomotor and regenerative resistor with the combinations listed in the instruction manual. Other combinations may lead to fires or faults.
- If safety standards (ex., robot safety rules, etc.,) apply to the system using the Motion controller, servo amplifier and servomotor, make sure that the safety standards are satisfied.
- Construct a safety circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safety directive operation in the system.
- In systems where coasting of the servomotor will be a problem during the emergency stop, the forced stop, servo OFF or when the power is shut OFF, use dynamic brakes.
- Make sure that the system considers the coasting amount even when using dynamic brakes.
- In systems where perpendicular shaft dropping may be a problem during the emergency stop, the forced stop, servo OFF or when the power is shut OFF, use both dynamic brakes and magnetic brakes.
- The dynamic brakes must be used only during the emergency stop, the forced stop and errors where servo OFF occurs. These brakes must not be used for normal braking.
- The brakes (magnetic brakes) assembled into the servomotor are for holding applications, and must not be used for normal braking.
- The system must have a mechanical allowance so that the machine itself can stop even if the stroke limits switch is passed through at the max. speed.
- Use wires and cables that have a wire diameter, heat resistance and bending resistance compatible with the system.
- Use wires and cables within the length of the range described in the instruction manual.
- The ratings and characteristics of the parts (other than Motion controller, servo amplifier, servomotor) used in a system must be compatible with the Motion controller, servo amplifier and servomotor.
- Install a cover on the shaft so that the rotary parts of the servomotor are not touched during operation.
- There may be some cases where holding by the magnetic brakes is not possible due to the service life time or mechanical structure (when the ball screw and servomotor are connected with a timing belt, etc.).Install a stopping device to ensure safety on the machine side.

3.2 External Circuit Design

As to the ways to design the external circuits of the Motion system, this section explains the method and instructions for designing the power supply circuits and safety circuits, etc.

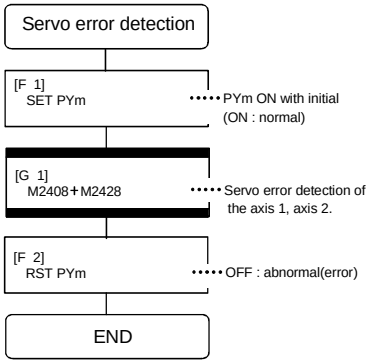
(1) Sample system circuit design for motion control



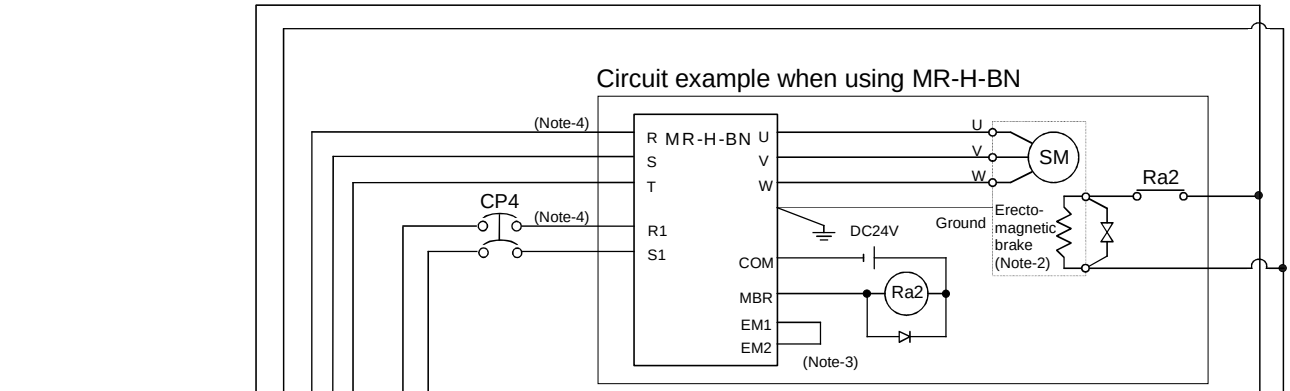
POINT

1) (Note-1) : The following is the Motion SFC program example.
2) (Note-2) : It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
3) (Note-3) : It is also possible to use forced stop signal of the servo amplifier.
4) It recommends using one leakage breaker for one servo amplifier. When electric power is supplied to multiple servo amplifiers for one leakage breaker, select the wire connected to the servo amplifier according to the capacity of the leakage breaker.
5) (Note-4) : Only the point has described the servo amplifier MR-J2M-B.
   Refer to "MR-J2M-B Servo amplifier Instruction Manual" for details.
6) (Note-5) : For information about connection of the SSCNET cable and termination connector refer to section 2.4.8 (4).

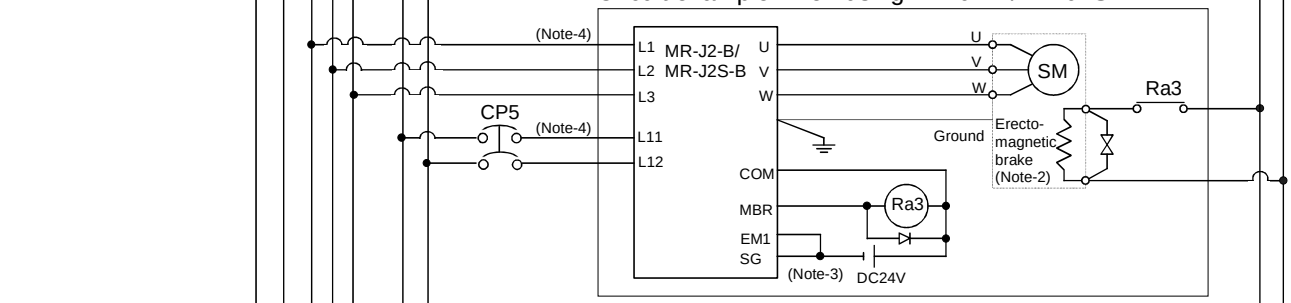
< Example> For control axis 1 and axis 2



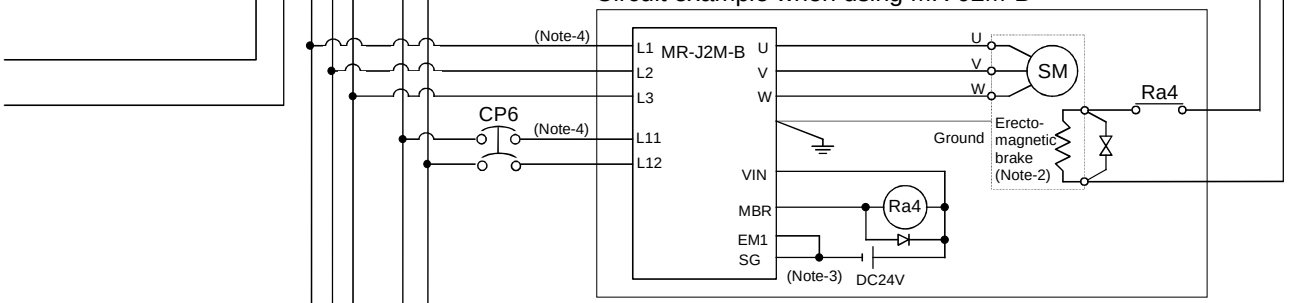
Circuit example when using MR-H-BN



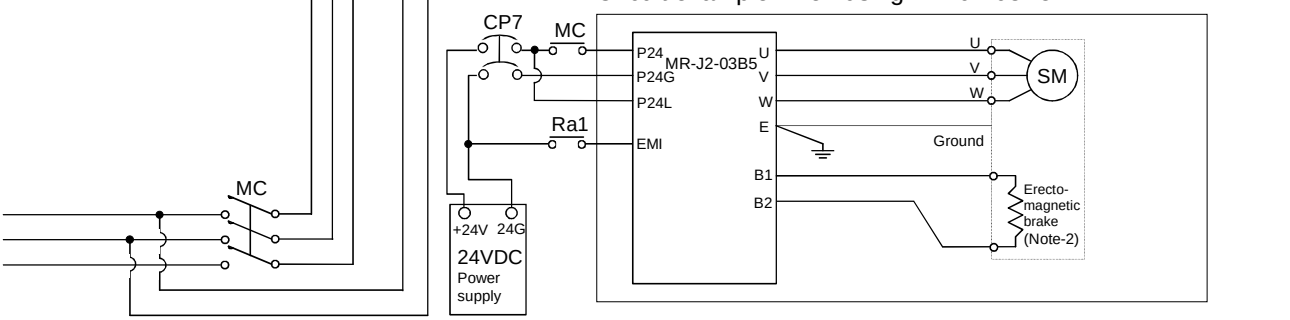
Circuit example when using MR-J2-B/MR-J2S-B



Circuit example when using MR-J2M-B (Note-5)

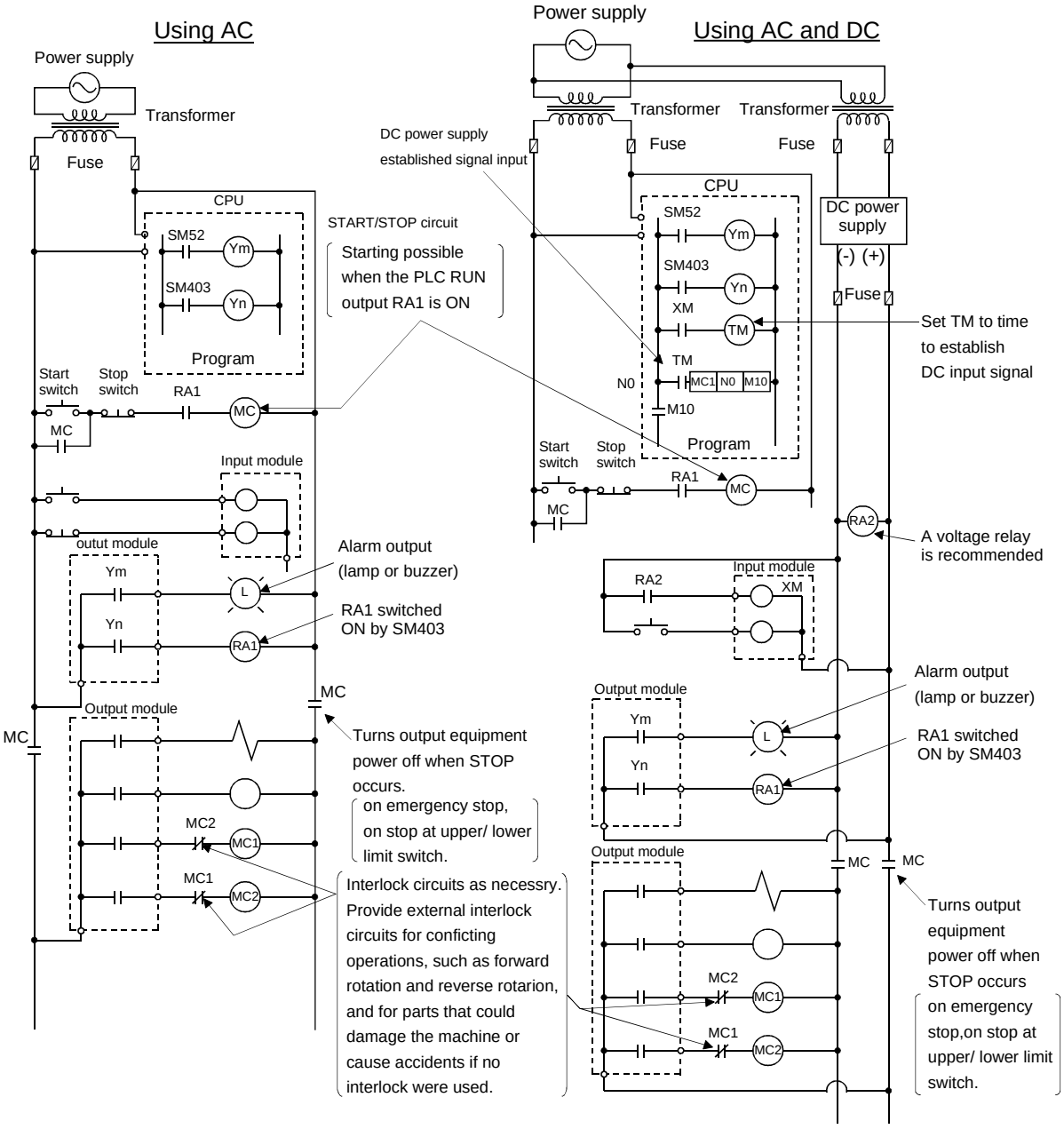


Circuit example when using MR-J2-03B5



(2) System design circuit example of the PLC I/O

(a) System design circuit example(when not using $\overline{\text{ERR}}$ contact of power supply module)



The power-ON procedure is as follows:

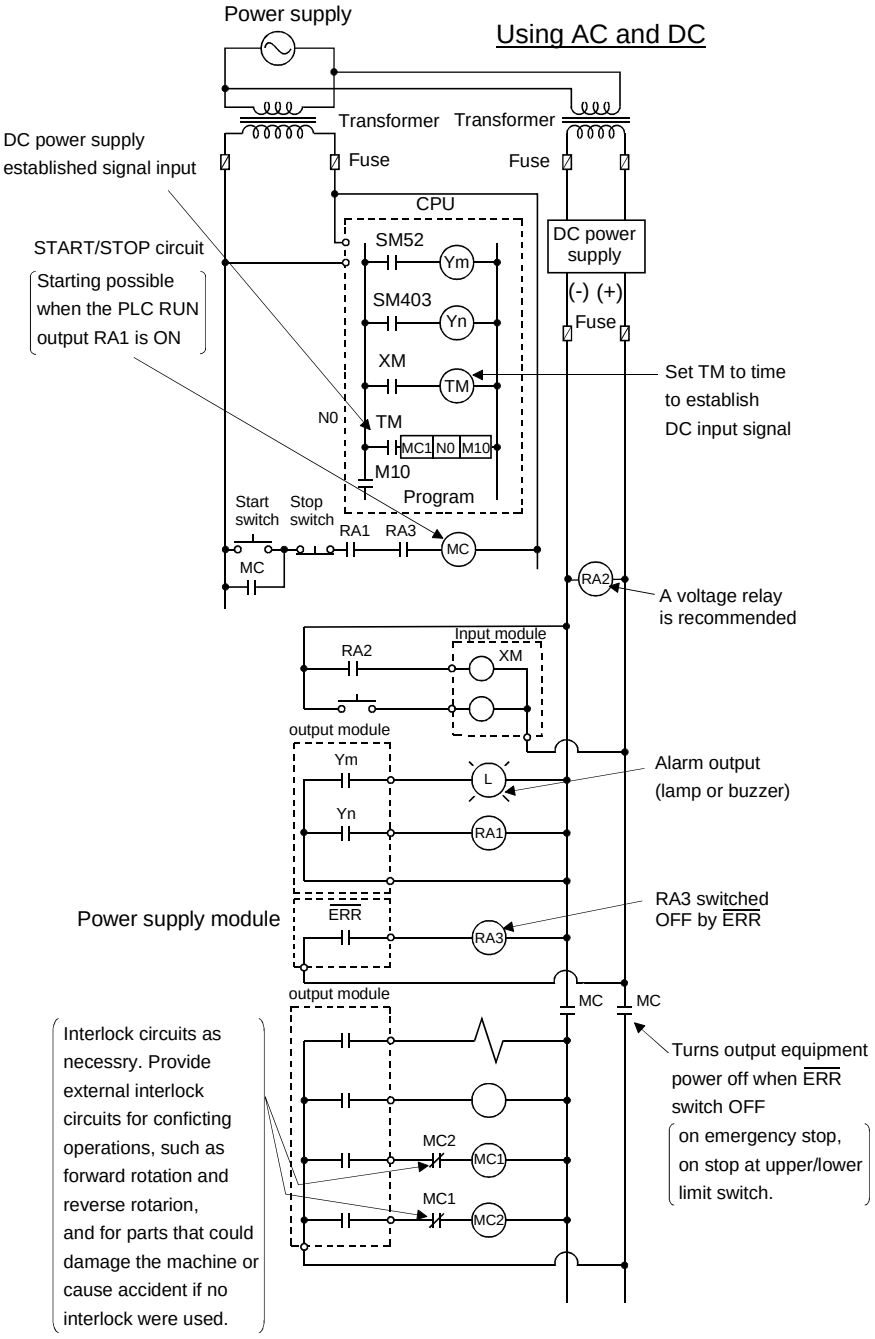
For AC

1) Switch power ON.
2) Set CPU to RUN.
3) Turn ON the start switch.
4) When the magnetic contactor (MC) comes on, the output equipment is powered and may be driven by the program.

For AC/DC

1) Switch power ON.
2) Set CPU to RUN.
3) When DC power is established, RA2 goes ON.
4) Timer (TM) times out after the DC power reaches 100%. (The TM set value should be the period of time from when RA2 goes ON to the establishment of 100% DC voltage. Set this value to approximately 0.5 seconds.)
5) Turn ON the start switch.
6) When the magnetic contactor (MC) comes on, the output equipment is powered and may be driven by the program. (If a voltage relay is used at RA2, no timer (TM) is required in the program.)

(b) System design circuit example(when using $\overline{\text{ERR}}$ contact of power supply module)



The power-ON procedure is as follows:

For AC/DC

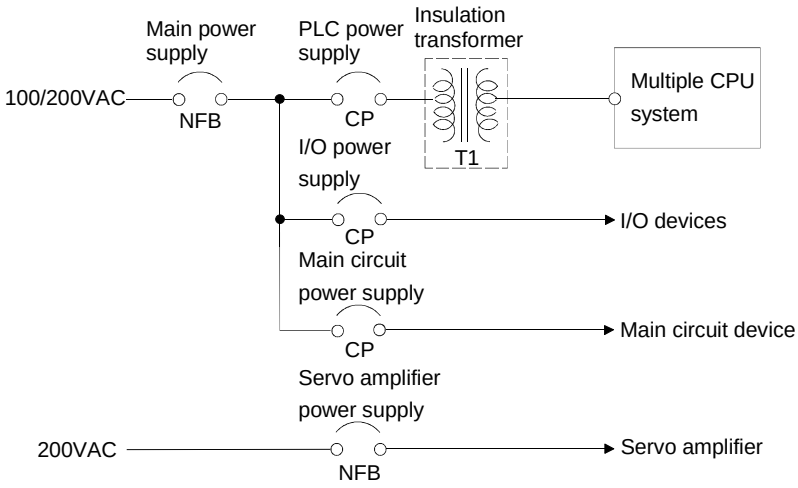
1) Switch power ON.
2) Set CPU to RUN.
3) When DC power is established, RA2 goes ON.
4) Timer (TM) times out after the DC power reaches 100%. (The TM set value should be the period of time from when RA2 goes ON to the establishment of 100% DC voltage. Set this value to approximately 0.5s.)
5) Turn ON the start switch.
6) When the magnetic contactor (MC) comes on, the output equipment is powered and may be driven by the program. (If a voltage relay is used at RA2, no timer (TM) is required in the program.)

3.2.1 Power supply circuit design

This section describes the protective coordination and noise suppression techniques of the power supply circuit.

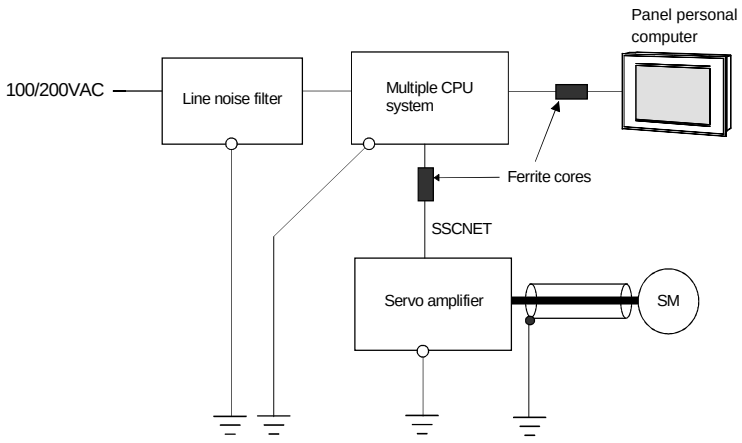
(1) Separation and protective coordination (leakage current protection, over current protection) of power supply lines

When wiring, separate the lines of Multiple CPU system power supplies from those of the I/O equipment and servo amplifier as shown below.
When there is much noise, connect an insulation transformer.



(2) Grounding

The motion system may malfunction as it is affected by various noises such as electric path noises from the power supply lines, radiated and induced noises from other equipment, servo amplifiers and their cables, and electromagnetic noises from conductors. To avoid such troubles, connect the earthing ground of each equipment and the shield grounds of the shielded cables to the earth.
Also use ferrite cores to prevent the sneak noises from the SSCNET.
For grounding, use the exclusive ground terminal wire of each equipment or a single-point earth method to avoid grounding by common wiring, where possible, since noises may sneak from other equipment due to common impedances.



3.2.2 Safety circuit design

(1) Concept of safety circuits

When the Motion controller is powered on-off, proper outputs may not be provided temporarily due to the delays and rise times of the Motion controller power supply and external I/O control power supplies (especially DC). Therefore, the circuit must be made up to enable the Motion controller to be powered on first. Also, abnormal operations may be performed when the external power supply becomes faulty or the Motion controller fails.
Constructed circuit of the parts (emergency stop, protective and interlock circuits, etc.) which may lead to machine breakdown and accidents due to abnormal operations at externally of the Motion controller in a fail-safe viewpoint, to prevent these abnormal operations from leading to the abnormal operation of the whole system.

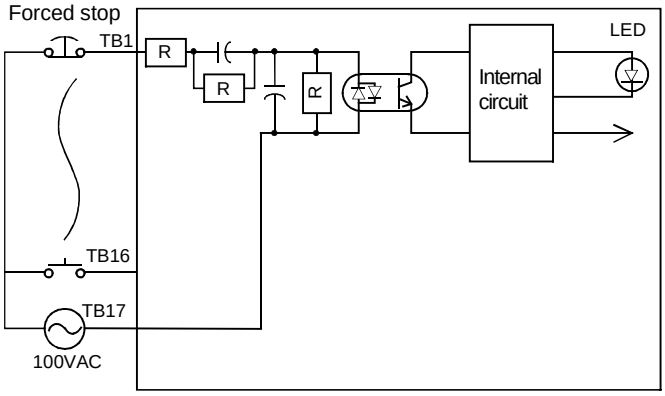
(2) Emergency stop circuit

The circuit should be constructed outside the Motion controller or servo amplifier. Shut off the power supply to the external servo amplifier by this circuit, make the magnetic brakes of the servomotor operated.

(3) Forced stop circuit

(a) It is possible to effect the forced stop all axes of the external servo amplifier (MR-H□BN/MR-J2□-B) at once via the forced stop input of the input modules. After the forced stop, remove the forced stop factor and cancel the forced stop. (The servo error detection signal does not turn on with the forced stop.)
It is possible to set the forced stop input No. by the parameter setting of the system setting.
The forced stop wiring example is shown below.

Input module (Example : QX10)



(Note): It is possible to set the forced stop (Xn) of the system settings at the user side.

(b) It is also possible to use the forced stop signal of the servo amplifier.
Refer to manual of the servo amplifier about servomotor capacity.
Operation status of the emergency stop and the forced stop are as follows.

Item	Operation of the signal ON	Remark
Emergency stop	Servo OFF	Shut off the power supply to the external servo amplifier by external circuit, make the servomotor stopped.
Forced stop		The servomotor is stopped according to the stop instruction from Motion controller to the servo amplifier.

3.3 Layout Design within The Control Panel

3.3.1 Installation environment

Install the Motion controller system in the following environment conditions.
(1) Ambient temperature is a range the following conditions.

Number of the Motion CPU	Q173CPUN/ Q172CPUN	Q173CPU/Q172CPU	
		With Cooling fan unit (Shipped from the factory)	Without Cooling fan unit
1	0 to 55°C (32 to 131 °F)		0 to 40°C (32 to 104°F)
2 or more			— (Note-1)

(Note-1) : It is need to install the Cooling fan unit(Q170FAN).

(2) Ambient humidity is in a range from 5% to 95% RH

(3) No condensing from sudden temperature changes

(4) No corrosive or inflammable gas

(5) There must not be a lot of conductible dust, iron filings, oil mist, or salt, organic solvents

(6) No direct sunlight

(7) No strong electrical or magnetic fields

(8) No direct vibrations or shocks on the Motion controller

3.3.2 Layout design of the base units

This section describes the precautions related to install a Motion controller in an enclosure.

(1) To improve ventilation and permit easy replacement of the module, leave a space of the following table between the top, bottom, side of the module and any other object.
(For details on layout design refer to section 4.1.2 “Instructions for installation of the base unit”.)

<table>
<tr><th colspan="2"></th><th>TOP</th><th>BOTTOM</th><th>SIDE</th></tr>
<tr><td rowspan="2">Q173CPUN/Q172CPUN
Q173CPU/Q172CPU
(Without Cooling fan unit)</td><td>Duct height to over 50mm(1.96inch)</td><td>40mm(1.57inch) or more</td><td rowspan="3">100mm(3.94inch) or more</td><td rowspan="3">5mm(0.19inch) or more</td></tr>
<tr><td>Duct height to 50mm(1.96inch) or less</td><td>30mm(1.18inch) or more</td></tr>
<tr><td colspan="2">Q173CPU/Q172CPU
(With Cooling fan unit)
(Shipped from the factory)</td><td>50mm(1.97inch) or more</td></tr>
</table>

(2) Provide a wiring duct, if required.

⚠ CAUTION

- Due to ventilation problems, do not install the base units vertically or horizontally.
- Install the base units on a flat surface. Unevenness or warping of the surface can apply undue force to printed circuit boards and lead to malfunctions.
- Avoid installing the base units close to a vibration source, such as a large electromagnetic contactor or no-fuse breaker. Install them on a separate panel or at a safe distance.
- To limit the effects of reflected noise and heat, leave 100mm(3.94inch) or more clearance to instruments fitted in front of the Motion controller (on the rear of the door).
  Similarly, leave 50mm(1.97inch) or more clearance between instruments and the left and right sides of the base units.

3.3.3 Calculating heat generation by Motion controller

The ambient temperature inside the control panel storing the Motion controller must be suppressed to a Motion controller operating ambient temperature of 55°C(131°F).
It is possible to remove the Cooling fan unit(Q170FAN) depending on the number of CPU modules or operating ambient temperature conditions.(Refer to section 2.4.10 Cooling fan unit (Q170FAN).)
For the design of radiation from the storing panel, it is necessary to know the average power consumption (heating value) of the devices and instruments stored in the control panel. Here the method of obtaining the average power consumption of Q173CPU(N)/ Q172CPU(N) system is described. From the power consumption, calculate a rise in ambient temperature inside the control panel.

Calculating average power consumption

The power consuming parts of the Motion controller are roughly classified into six blocks as shown below.

(1) Power consumption of the power supply module
The power conversion efficiency of the power module is approx. 70 %, i.e., 30 % of the output power is consumed by heating. As a result, 3/7 of the output power becomes the power consumption.
Therefore the calculation formula is as follows.

$$Wpw=\frac{3}{7}\times(I_{5V}\times 5)[W]$$

I_{5V}: Current consumption of logic 5 VDC circuit of each module

(2) Power consumption of a total of 5 VDC logic section of each module
The power consumption of the 5 VDC output circuit section of the power module is the power consumption of each module (including the current consumption of the base unit).

$W_{5V} = I_{5V} \times 5$ [W]

(3) A total of 24 VDC average power consumption of the output module (power consumption for simultaneous ON points)
The average power of the external 24 VDC power is the total power consumption of each module.

$W_{24V} = I_{24V} \times 24$ [W]
I_{24V}: Current consumption of the output module

(4) Average power consumption due to voltage drop in the output section of the output module
(Power consumption for simultaneous ON points)

$W_{OUT} = I_{OUT} \times$ Vdrop $\times$ Number of outputs $\times$ Simultaneous ON rate [W]

I_{OUT} : Output current (Current in actual use) [A]
Vdrop : Voltage drop in each output module [V]

(5) Average power consumption of the input section of the input module(Power consumption for simultaneous ON points)

$W_{IN} = I_{IN} \times E \times$ Number of input points $\times$ Simultaneous ON rate [W]

I_{IN} : Input current (Effective value for AC) [A]
E : Input voltage (Voltage in actual use) [V]

(6) Power consumption of the power supply section of the intelligent function module

$W_S = I_{5V} \times 5 + I_{24V} \times 24 + I_{100V} \times 100$ [W]

The total of the power consumption values calculated for each block becomes the power consumption of the overall motion system.

$W = W_{PW} + W_{5V} + W_{24V} + W_{OUT} + W_{IN} + W_S$ [W]

From this overall power consumption (W), calculate the heating value and a rise in ambient temperature inside the control panel.
The outline of the calculation formula for a rise in ambient temperature inside the control panel is shown below.

$$T = \frac{W}{UA} \ [^{\circ}C]$$

W : Power consumption of overall Motion system (value obtained above)
A : Surface area inside the control panel
U : When the ambient temperature inside the board is uniformed by a fan..... 6
When air inside the board is not circulated..... 4

POINT

When a rise in ambient temperature inside the control panel exceeds the specified limit, it is recommended that you install a heat exchanger in the control panel to lower the ambient temperature inside the control panel.
If a normal ventilating fan is used, dust will be sucked into the Motion controller together with the external air, and it may affect the performance of the Motion controller.

(7) Example of average power consumption calculation (When using the Q173CPU)

(a) System configuration



(b) 5 VDC current consumption of each module

Q02HCPU	: 0.64 [A]
Q173CPU	: 1.75 [A]
Q172LX	: 0.05 [A]
Q172EX	: 0.07 [A]
Q173PX	: 0.11 [A]
QX40	: 0.05 [A]
QY10	: 0.43 [A]
Q38B	: 0.114 [A]

(c) Power consumption of power module

$W_{PW} = 3/7 \times (0.64 + 1.75 + 0.05 + 0.07 + 0.11 + 0.05 + 0.05 + 0.43 + 0.43 + 0.114) \times 5 = 7.92$ [W]

(d) Power consumption of a total of 5 VDC logic section of each module

$W_{5V} = (0.64 + 1.75 + 0.05 + 0.07 + 0.11 + 0.05 + 0.05 + 0.43 + 0.43 + 0.114) \times 5) = 18.47$ [W]

(e) A total of 24 VDC average power consumption of the output module
W_{24V} = 192 [W] (8A/common)

(f) Average power consumption due to voltage drop in the output section of the output module
W_{OUT} = 0 [W]

(g) Average power consumption of the input section of the input module
$W_{IN} = 0.004 \times 24 \times 32 \times 1 = 3.07$ [W]

(h) Power consumption of the power supply section of the intelligent function module
W_S = 0 [W]

(i) Power consumption of overall system.
W = 7.92 + 18.47 + 192 + 0 + 3.07 + 0 = 221.46 [W]

3.4 Design Checklist

At the worksite, copy the following table for use as a check sheet.

Item	Sub Item	Design confirmation		Check
Module selection	CPU module selection	Number of axes	axes	☐
		Number of I/O points	points	☐
		Motion CPU module selection		☐
		QCPU module selection		☐
	Motion module selection	Number of Manual pulse generators	pcs.	☐
		Number of Synchronous encoders	pcs.	☐
		Number of upper limit points	points	☐
		Number of lower limit points	points	☐
		Number of STOP input points	points	☐
		Number of proximity dog input points	points	☐
		Number of speed switching input points	points	☐
		Number of tracking enable signal points	points	☐
		Q172LX	modules	☐
		Q172EX	modules	☐
		Q173PX	modules	☐
	CPU base unit selection	Number of Motion CPU modules	modules	☐
		Number of I/O modules installed to CPU base	modules	☐
		CPU base unit selection		☐
	Extension base unit and extension cable selection	Number of I/O modules installed to extension base	modules	☐
		Distance between CPU base and extension base	mm	☐
		Extension base unit selection		☐
		Extension cable selection		☐
External circuit design	Fail-safe circuit design	Avoidance of malfunction at power-on		☐
		Avoidance of hazard at Motion controller failure		☐
Layout design	Module layout design	Conformance with general specifications such as ambient temperature, humidity, dust, dirt, etc.		☐
		Power consumption of overall base unit (Calculate the heating value)	W	☐
		Layout in consideration of clearances between enclosure's inside walls, other structures and modules and heats generated by modules within the control panel.		☐

4. INSTALLATION AND WIRING

4.1 Module Installation

4.1.1 Instructions for handling

⚠ CAUTION

- Use the Motion controller in an environment that meets the general specifications contained in this manual. Using this Motion controller in an environment outside the range of the general specifications could result in electric shock, fire, erroneous operation, and damage to or deterioration of the product.
- Hold down the module loading lever at the module bottom, and securely install the module fixing hook into the fixing hole in the base unit. Incorrect loading of the module can cause a malfunction, failure or drop. When using the Motion controller in the environment of much vibration, tighten the module with a screw. Tighten the screw in the specified torque range. Under tightening can cause a drop, short circuit or malfunction. Over tightening can cause a drop, short circuit or malfunction due to damage to the screw or module.
- Be sure to install the extension cable to connectors of the base unit correctly. After installation, check them for looseness. Poor connections could cause an input or output failure.
- Completely turn off all lines of power supply externally before loading or unloading the module. Not doing so could result in electric shock or damage to the product.
- Do not directly touch the module's conductive parts. Touching the conductive parts could cause an operation failure or give damage to the module.

This section describes instructions for handling the CPU modules, I/O modules, intelligent function modules, power supply modules and base units, etc. .

(1) Do not drop or apply strong impact on the CPU modules, I/O modules, intelligent function modules, power supply modules, base units and memory card, etc. .

(2) Do not remove modules printed circuit boards from the case in order to avoid changes in operation.

(3) The module fixing screws and terminal block screws within the tightening torque range specified below.

Location of screw	Tightening torque range
Module fixing screw (M3 × 12 screw)	36 to 48 × 10^{-2} N•m
I/O module terminal block screw (M3 screw)	42 to 58 × 10^{-2} N•m
I/O module terminal block fixing screw (M3 screw)	66 to 89 × 10^{-2} N•m
Power supply module terminal screw (M3.5 screw)	59 to 78 × 10^{-2} N•m

(4) Make sure to install the power supply module on the CPU base unit and extension base unit. When the power supply module is not installed and if the I/O modules and intelligent function module installed on the base units are of light load type, the modules may be operated. In this case, because a voltage becomes unstable, we cannot guarantee the operation.

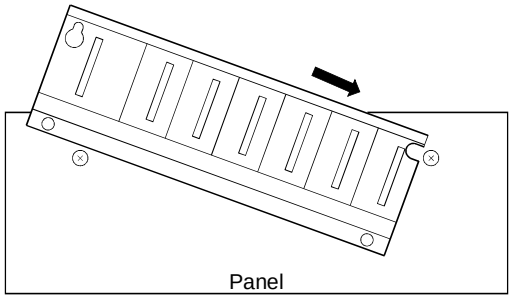
(5) When an extension cable is used, do not bind the cable together with the main circuit (high voltage, heavy current) line or lay them close to each other.

(6) Install the CPU base unit (by screwing) in the following procedure.

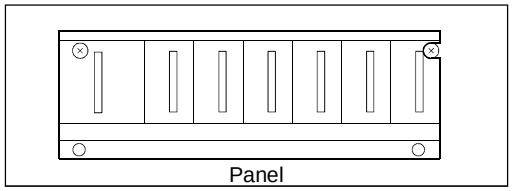
1) Fit the two fixing screws for top of the CPU base unit to the panel.



2) Place the right-hand side notch of the CPU base unit onto the right-hand side screw.



3) Place the left-hand side pear-shaped hole of the CPU base unit onto the left-hand side screw.



4) Fit the fixing screws into the fixing screw holes in the CPU base unit bottom and re-tighten the four fixing screws.

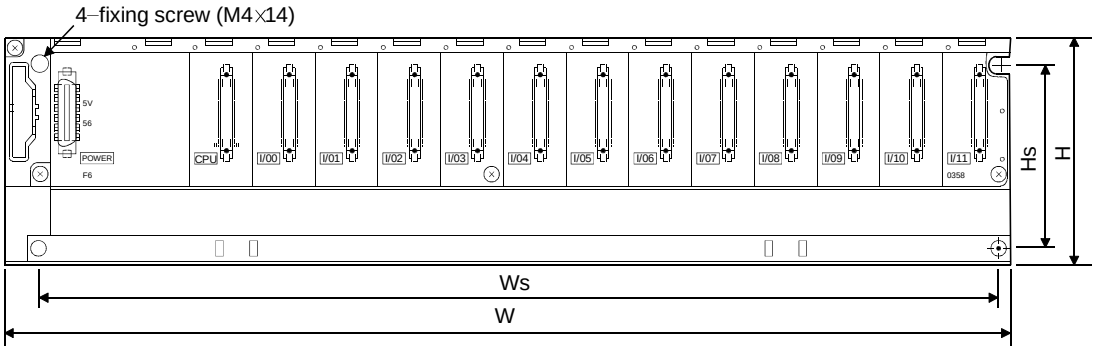
(Note) : Install the CPU base unit to a panel, with no module installed in the rightmost slot.
Remove the CPU base unit after unloading the module from the rightmost slot.

4.1.2 Instructions for installation of the base unit

Install the Motion controller module to a panel, etc. , considering enough about operability, maintainability and environmental resistance.

(1) Fitting dimensions

Fitting dimensions of each base unit are as follows:

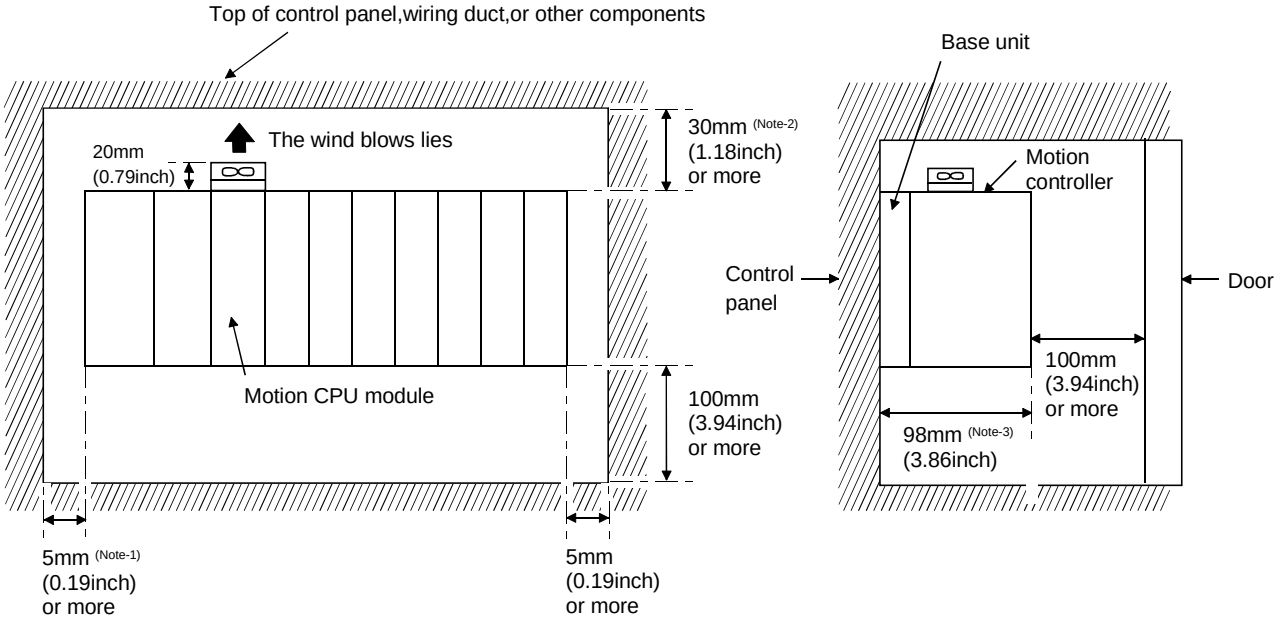


	Q35B	Q38B	Q312B	Q65B	Q68B	Q612B
W	245 (9.65)	328 (12.92)	439 (17.30)	245 (9.65)	328 (12.92)	439 (17.30)
Ws	224.5 (8.85)	308 (12.14)	419 (16.51)	222.5 (8.77)	306 (12.06)	417 (16.43)
H	98 (3.86)					
Hs	80 (3.15)					

Unit: mm (inch)

(2) Motion controller installation position

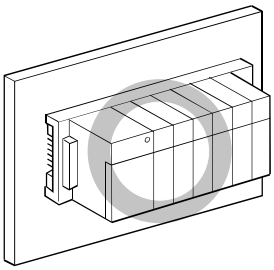
For enhanced ventilation and ease of module replacement, leave the following clearances between the module top/bottom and structure/parts.



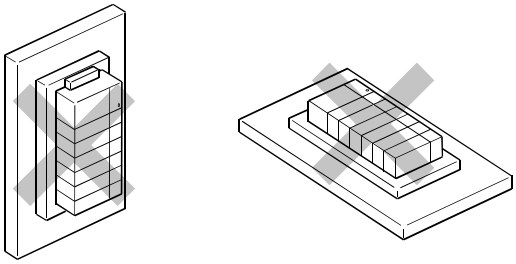
(Note-1) : 20mm (0.79 inch) or more when the adjacent module is removed and the extension cable is connected.
(Note-2) : Q173CPU/Q172CPU : 50mm (1.97 inch) or more
Q173CPUN/Q172CPUN(Height of a wiring duct is 50mm (1.97 inch) or more) : 40mm (1.58 inch)
(Note-3) : Q173CPUN/Q172CPUN : 123mm (4.84 inch)

(3) Motion controller installation orientation

(a) Since the Motion controller generates heat, it should be fitted on a well ventilated location in the orientation shown below.



(b) Do not use it in either of the orientations shown below.



Vertical Flat

(4) Installation surface

Fit the base unit on a flat surface. If the installation surface is not even, this may strain the printed circuit boards and cause malfunctions.

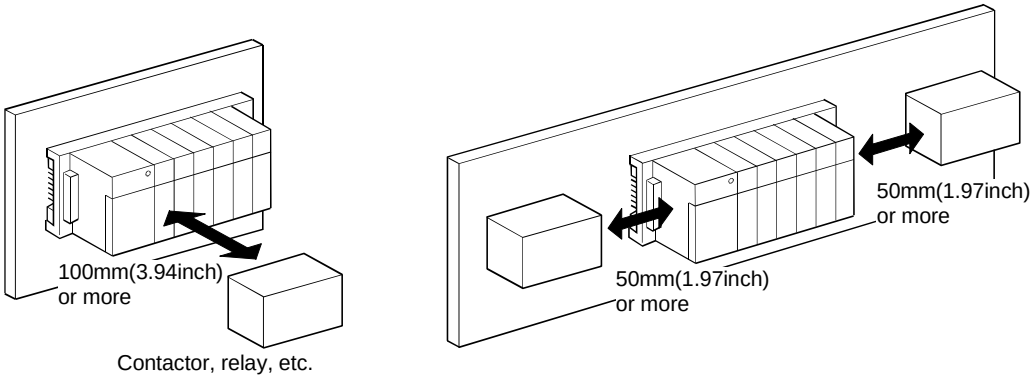
(5) Installation of Motion controller in an area where the other devices are installed

Avoid fitting base unit in proximity to vibration sources such as large magnetic contractors and no-fuse circuit breakers; fit them on a separate panel or at a distance.

(6) Distances from the other devices

In order to avoid the effects of radiated noise and heat, provide the clearances indicated below between the Motion controller and the other devices that generate noise or heat (contactors and relays).

- In front of Motion controller: 100 mm (3.94 inch) or more
- On the right and left of Motion controller: 50 mm (1.97 inch) or more



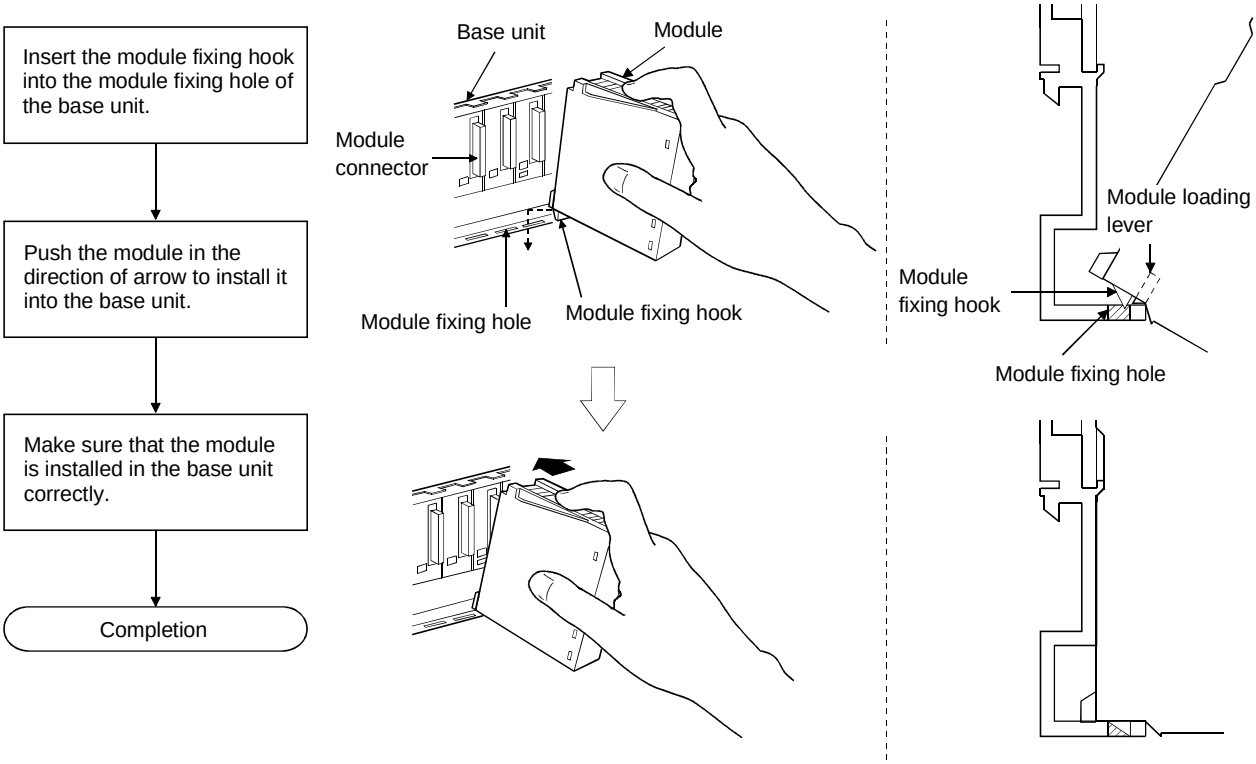
4.1.3 Installation and removal of module

This section explains how to install and remove a power supply module, PLC CPU module, Motion CPU module, Motion module, I/O module, intelligent function module or another module to and from the base unit.

(1) Installation and removal of the module from Q3□B,Q6□B

The installation and removal of the module from Q3□B/Q6□B base unit are described below.

(a) Installation of the module on Q3□B and Q6□B

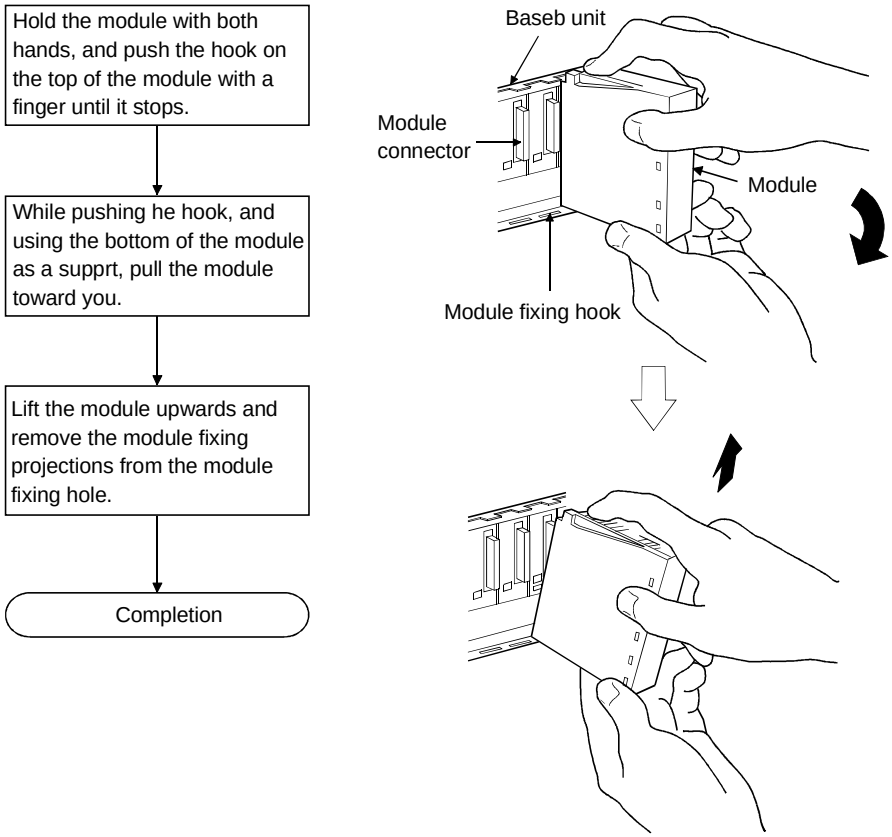


POINTS

(1) Always insert the module fixing hook of the module into the module fixing hole. Forcing the hook into the hole will damage the module connector and module.

(2) When using the modules in a place where there is large vibration or impact, screw the CPU module to the base unit.
Module fixing screw : M3 × 12 (purchase from the other supplier)

(b) Removal from Q3□B and Q6□B



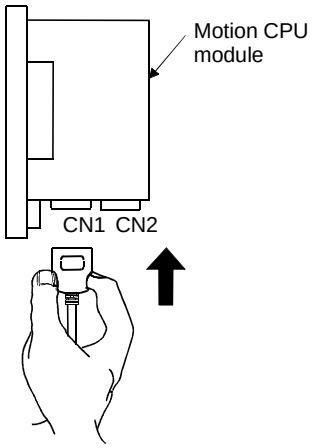
POINT
When the module fixing screw is used, always remove the module by removing the module fixing screw and then taking the module fixing hook off the module fixing hole of the base unit. Forcibly removal the module will damage the module.

4.2 Installation and Removal of Cable

4.2.1 Installation and removal of the SSCNET cable

(1) Instructions for handling the SSCNET cable

- Do not stamp the SSCNET cable.
- When laying the SSCNET cable, the minimum bending radius of the cable should be 30 mm(1.18 inch) or more.
  If it is less than 30 mm(1.18 inch), a malfunction may occur due to characteristic deterioration, open cable, etc. .
- Hold the connector part of the SSCNET cable for connection or disconnection.



(2) Installation of the SSCNET cable

- When connecting the SSCNET cable to the Motion CPU module, holding the connector part of the SSCNET cable, connect the SSCNET cable to the connector CN1 or CN2 of the Motion CPU module. Connect the connector securely until it clicks.

(3) Removal of the SSCNET cable

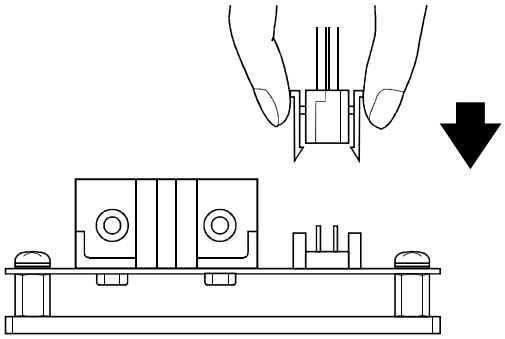
- When removing the SSCNET cable, hold and pull the connector part of the SSCNET cable after making sure that the fixing hook have been removed completely.

POINT
Forcibly removal the SSCNET cable from the CPU module will damage the modules.

4.2.2 Installation and removal of the battery cable

(1) Instructions for handling the battery cable

• Hold the connector part of the battery cable for connection or disconnection.



(2) Installation of the battery cable

• When connecting the battery cable to the Dividing unit/Battery unit, holding the connector part of the battery cable, connect the battery cable to the connector(BAT) of the Dividing unit/Battery unit.
Connect the connector securely until it clicks.

(3) Removal of the battery cable

• When removing the battery cable, hold and pull the connector part of the battery cable after making sure that the fixing hook have been removed completely.

POINT
Forcibly removal the SSCNET cable from the CPU module will damage the modules.

4.3 Installation of the Serial Absolute Synchronous Encoder

This section described instructions for handling the Serial absolute synchronous encoder (MR-HENC).

(1) If the serial absolute synchronous encoder is linked to a chain, timing belt, or gears, the machine rotating shaft should be supported by a separate bearing and connected to MR-HENC through a coupling. Ensure that excessive force (greater than the permitted shaft load) is not applied to the encoder.

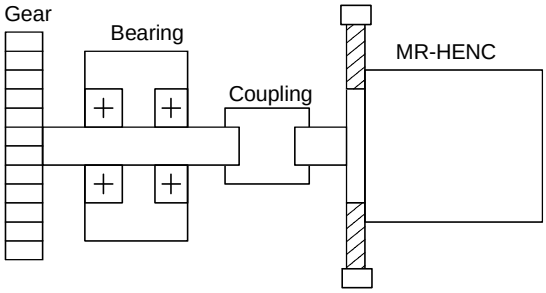


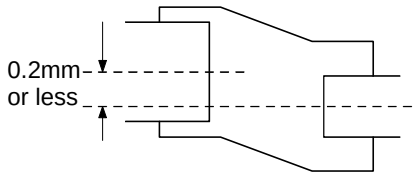
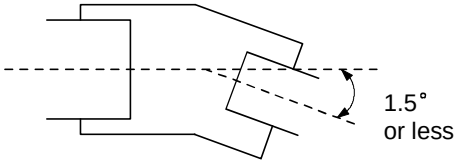
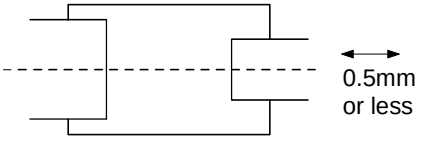
Fig. 4.1 Example of Encoder Linked to a Gear

Table 4.1 Permitted Shaft Loads

	Radial direction	Thrust direction
Permitted shaft load	Max. 98N	Max. 49N

(2) Large errors in eccentricity and angle of deviation during installation can apply an excessive force to the MR-HENC shaft, which can cause deterioration in performance drastically reduce encoder service time.
Minimize loads applied to the shaft such that they lie within the permitted shaft load range. The permitted shaft loads are shown in table 4.2 for the recommended coupling type.

Table 4.2 Permitted Values for Coupling Mounting Errors

Eccentricity	
Angle of deviation	
Axial displacement	

Recommended coupling type specifications

Item	Specification
Max. torque	0.5N/m
Max. speed	10000r/min

⚠ CAUTION

- The MR-HENC contains a glass disk and precision mechanism. Take care when handling it. The encoder performance may deteriorate if it is dropped or subjected to shocks or vibration exceeding the prescribed limits.
- Do not connect the encoder directly to the rotating machine shaft. Always connect the encoder through a flexible coupling.

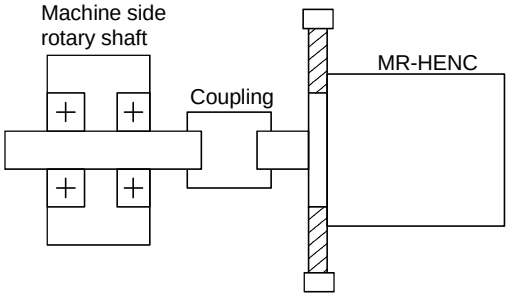


Fig 4.2 Connecting the encoder to a machine side rotary shaft.

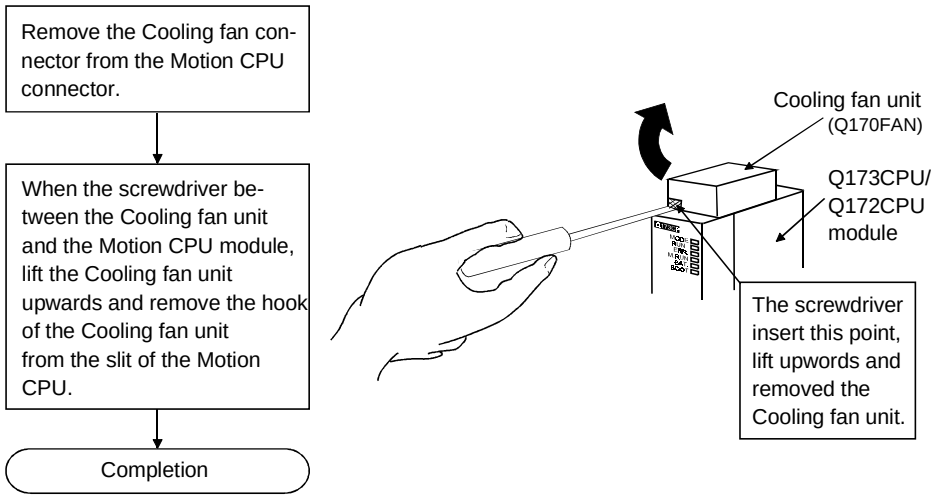
- Never hit the end of the MR-HENC coupling shaft with a hammer when connecting the coupling to it. The large loads applied to MR-HENC will damage it.
- The MR-HENC uses optical parts. Install it in an atmosphere where there are extremely few water drops and little oil and dust.
- In any place where the MR-HENC is exposed to water and/or oil, provide protection from oil and water, e.g. install a cover. In addition, run the cable downward to prevent oil and/or water from running on the cable into the MR-HENC. When it is inevitable to install the MR-HENC vertically or obliquely, trap the cable.
- Use the MR-HENC within the specified temperature range (0 to 55°C (32 to 131°F)).

4.4 Replacement of the Cooling fan unit (Q170FAN) (Q173CPU/Q172CPU only)

(1) Removal and installation of the Cooling fan unit (Q170FAN)

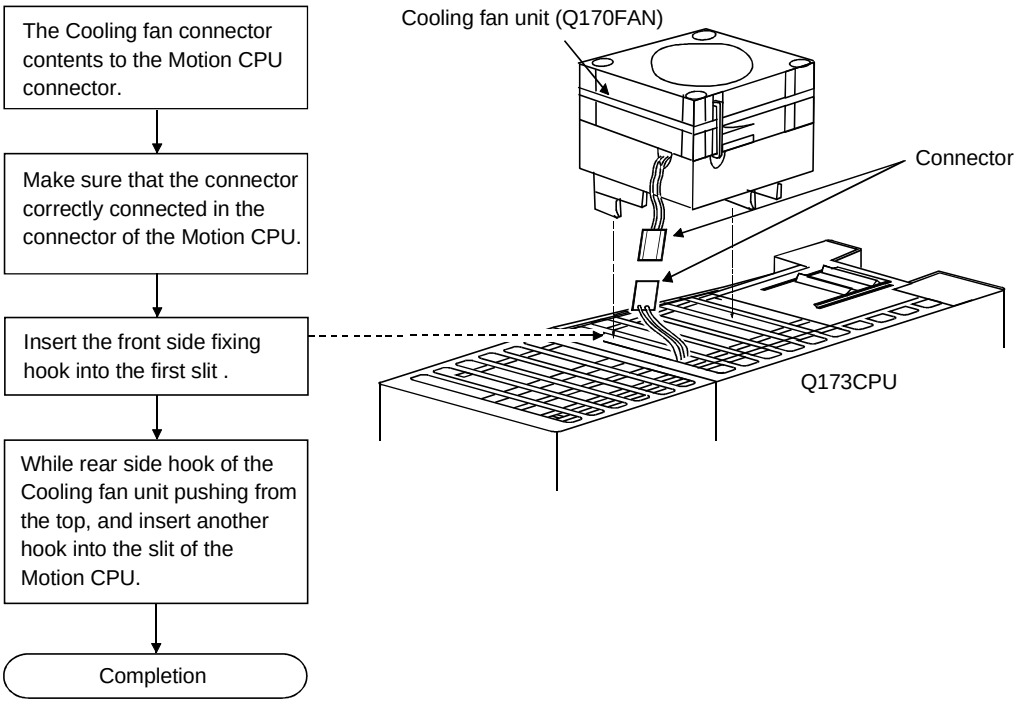
(a) Removal of Cooling fan unit from Q173CPU/Q172CPU

The removal of the Cooling fan unit are described below.



(b) Installation of Cooling fan unit on Q173CPU/Q172CPU

The installation of the Cooling fan unit are described below.



⚠ CAUTION
● Forcibly installation or removal the Cooling fan unit will damage the cover or printed circuit board of modules.

4.5 Wiring

4.5.1 Instructions for wiring

⚠ DANGER

- Completely turn off the all lines of the power supply externally before wiring. Not completely turning off all power could result in electric shock or damage to the product.
- When turning on the power supply or operating the module after wiring, be sure that the module's terminal covers are correctly attached. Not attaching the terminal cover could result in electric shock.

⚠ CAUTION

- Be sure to ground of the earth terminal FG and LG. Not doing so could result in electric shock or erroneous operation. (Ground resistance: 100Ω or less)
- When wiring in the Motion controller, be sure that it is done correctly by checking the product's rated voltage and the terminal layout. Connecting a power supply that is different from the rating or incorrectly wiring the product could result in fire or damage.
- External connections shall be crimped or pressure welded with the specified tools, or correctly soldered. Imperfect connections could result in short circuit, fires, or erroneous operation.
- Tighten the terminal screws with the specified torque. If the terminal screws are loose, it could result in short circuits, fire, or erroneous operation. Tightening the terminal screws too far may cause damages to the screws and/or the module, resulting in fallout, short circuits, or malfunction.
- Be sure there are no foreign substances such as sawdust or wiring debris inside the module. Such debris could cause fires, damage, or erroneous operation.
- The module has an ingress prevention label on its top to prevent foreign matter, such as wire offcuts, from entering the module during wiring.
  Do not remove this label during wiring.
  Before starting system operation, be sure to remove this label because of heat dissipation.

This section described instructions for the instructions for the wiring of the power supply.

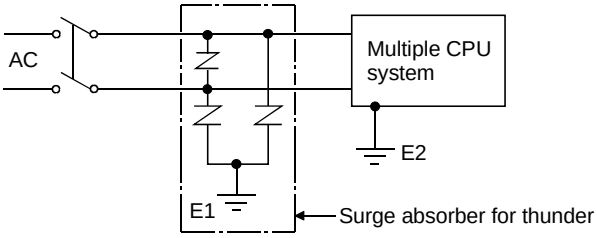
(1) Power supply wiring

(a) 100VAC, 200VAC and 24VDC wires should be twisted as dense as possible.
Connect the modules with the shortest distance.
Also, to reduce the voltage drop to the minimum, use the thickest wires possible (max. 2mm^2).
Use the wires of the following core size for wiring.

Application	Recommended core size
100VAC, 200VAC, 24VDC wires	Thickest possible wires of 2.0mm^2
I/O equipment	0.75mm^2(0.75 to 1.5mm^2 usable)
Ground wire	2.0mm^2 or more

(b) Do not bind the cable together with the main circuit (high voltage, large current) line of the 100VAC and 24VDC or lay them close to each other. If possible, leave them 100mm (3.94inch) or more away.

(c) As a countermeasure to power surge due to thunder, connect a surge absorber for thunder as shown below.



POINT

(1) Separate the ground of the surge absorber for thunder (E1) from that of the PLC (E2).

(2) Select a surge absorber for thunder whose power supply voltage does no exceed the maximum allowable circuit voltage even at the time of maximum power supply voltage elevation.

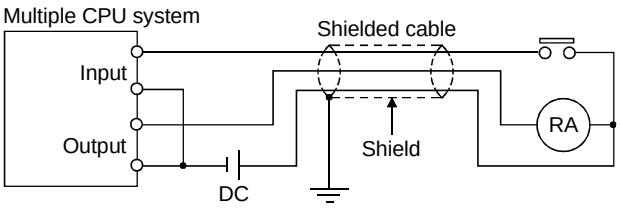
(2) Wiring of I/O equipment

(a) Insulation-sleeved crimping terminals cannot be used with the terminal block. It is recommended to cover the wire connections of the crimping terminals with mark or insulation tubes.

(b) The wires used for connection to the terminal block should be 0.3 to 0.75mm^2 in core and 2.8mm (0.11inch) or less in outside diameter.

(c) Run the input and output lines away from each other.

(d) When the wiring cannot be run away from the main circuit and power lines, use a batch-shielded cable and ground it on the Motion controller side. In some cases, ground it in the opposite side.



(e) Where wiring runs through piping, ground the piping without fail.

(f) Run the 24VDC input line away from the 100VAC and 200VAC lines.

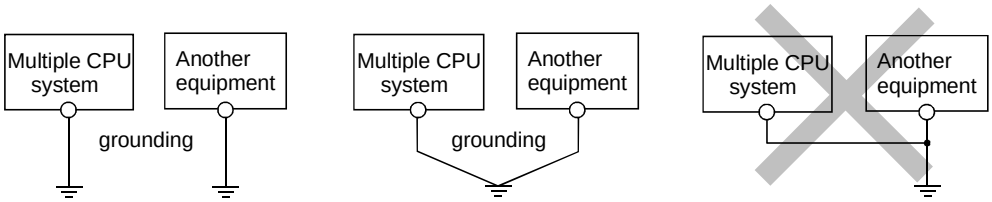
(g) Wiring of 200m (686.67ft.) or more distance will give rise to leakage currents due to the line capacity, resulting in a fault.
Refer to the troubleshooting chapter of the I/O Module User's Manual.

(3) Grounding

To ground the cable, follow the steps (a) to (c) shown below.

(a) Use the dedicated grounding as independent as possible.
(Ground resistance: 100Ω or less)

(b) When the Multiple CPU system and the another equipment cannot be departed to ground the cable each other, use (2) Common Grounding shown below.

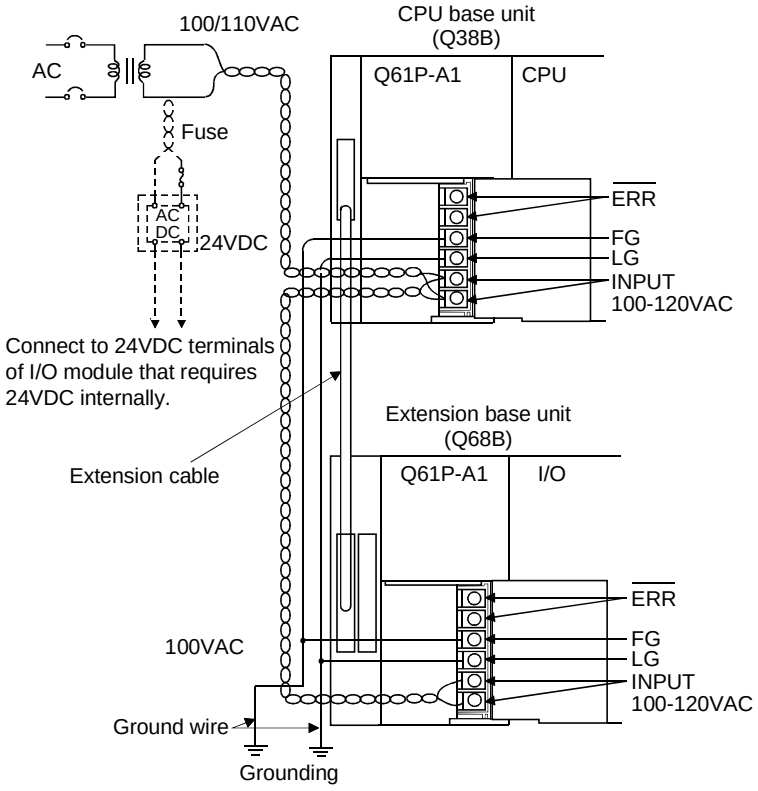


(1) Independent grounding.....Best (2) Common grounding.....Good (3) Joint grounding.....Not allowed

(c) Use the grounding cable of 2 mm^2 or more.
Position the ground-contact point as nearly to the Multiple CPU system as possible, and use the total length of the grounding cable as short as possible.

4.5.2 Wiring to the power supply module

The following diagram shows the wiring example of power lines, grounding lines, etc. to the CPU and extension base units.



POINTS

(1) Use the thickest possible (max. 2 mm^2) wires for the 100/200 VAC and 24 VDC power cables. Be sure to twist these wires starting at the connection terminals. To prevent a short-circuit should any screws loosen, use solderless terminals with insulation sleeves.

(2) When the LG terminals and FG terminals are connected, be sure to ground the wires. If LG terminals and FG terminals are connected without grounding the wires, the Motion controller may be susceptible to noise. In addition, since the LG terminals have potential of ½ input voltage, the operator may receive an electric shock when touching metal parts.

4.6 Installation/Wiring Checklist

At the worksite, copy the following table for use as a check sheet.

Item	Sub Item	Installation/wiring confirmation	Check
Installation of module	Installation of the base unit	Check for loose or distorted installation.	☐
		Check that the fixing screw tightening torque is as specified.	☐
		Check the unit for damage.	☐
	Installation of modules to the base unit	Check that the installation module models are correct.	☐
		Check that the Q173CPU(N)/Q172CPU(N) and Q CPU are installed to the Motion CPU slots/PLC CPU slots.	☐
		Check that the Q172LX/Q172EX and Q173PX are installed to the Motion CPU control slots.	☐
		Check for loose or distorted installation.	☐
		Check that the module fixing screw tightening torque is as specified.	☐
	Installation of the Dividing unit	Check that the combination Q173CPU(N) and the Dividing unit are correct.	☐
		Check for loose or distorted installation.	☐
		Check that the module fixing screw tightening torque is as specified.	☐
	Installation of the Battery unit	Check that the combination Q172CPU(N) and the Battery unit are correct.	☐
		Check for loose or distorted installation.	☐
		Check that the module fixing screw tightening torque is as specified.	☐
	Installation of the Synchronous encoder	Check that the amplitude, eccentricity and axial displacement relative to the machine side rotary shaft are within the permissible values.	☐
		Check that a flexible coupling is used for coupling with the machine side rotary shaft.	☐
		Check the module for damage.	☐
		Check that excessive impact was not given during installation.	☐
Wiring	Wiring of the power supply modules and I/O modules wires	Check that the 100VAC, 200VAC and 24VDC wires are twisted as closely as possible and run in the shortest distance.	☐
		Check that the 100VAC, 200VAC and 24VDC wires are not bind the cable together with and run close to the power and I/O wires.	☐
		Check that each wiring is of the specified wire size.	☐
		Check for loose or distorted.	☐
		Check that the terminal block screw tightening torque is as specified.	☐
		Check that grounding the dedicated grounding.	☐
	Wiring of the SSCNET cable	When using Q173DV, check that the Q173CPU(N) and Q173DV are connected to the SSCNET cable.	☐
		When using the external battery, Check that the Q172CPU(N) and Q170BAT are connected to the SSCNET cable.	☐
		Check that SSCNET cable modules are correct. Connection between Q173CPU(N)/Q172CPU(N) and servo amplifier (when using the Dividing cable), Q173DV and servo amplifier (when using Q173DV), and servo amplifier and servo amplifier.	☐
		Check for loose or distorted connector and connective.	☐

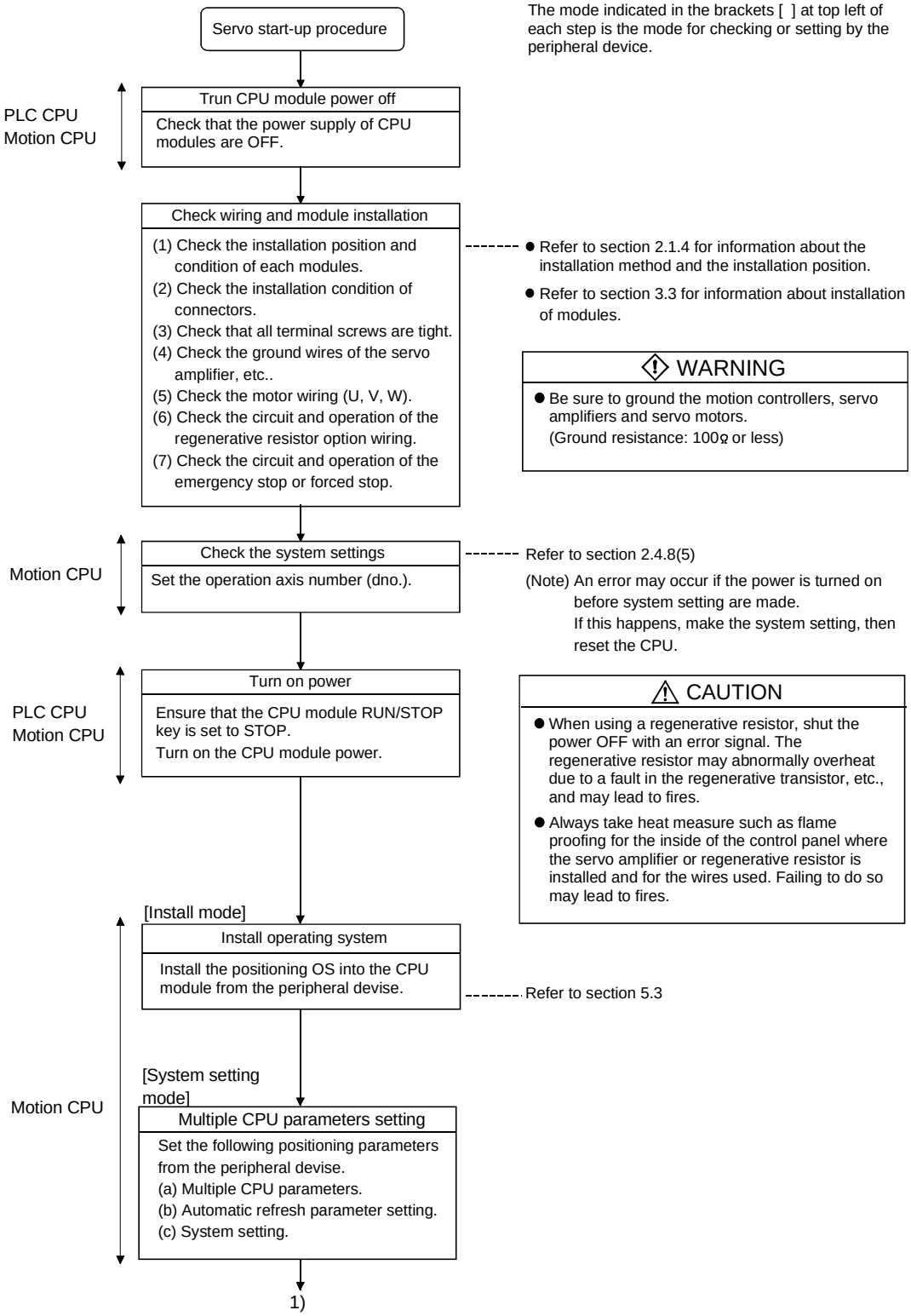
5. TRIAL RUN AND ADJUSTMENT

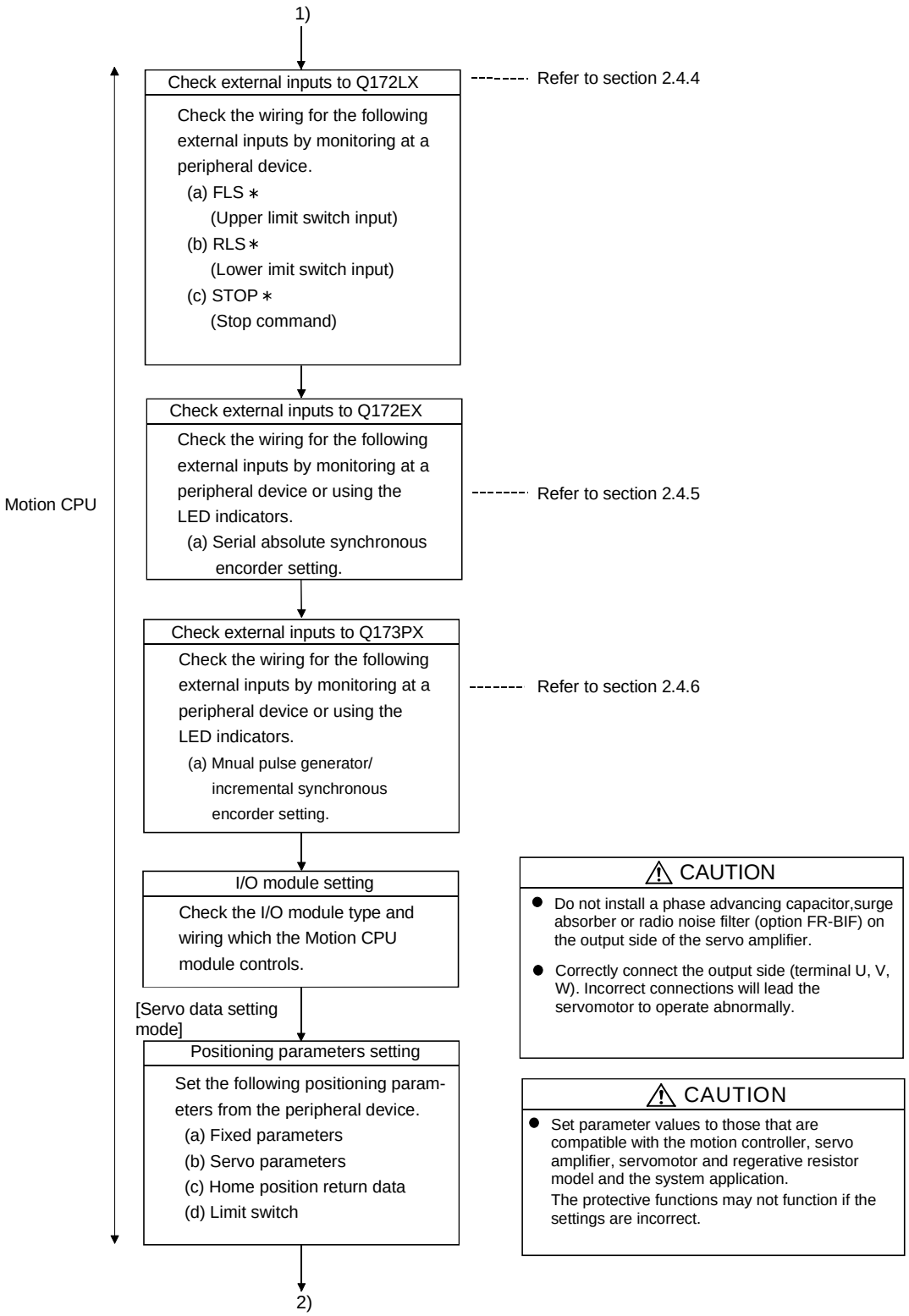
5.1 Checklist before Trial Operation

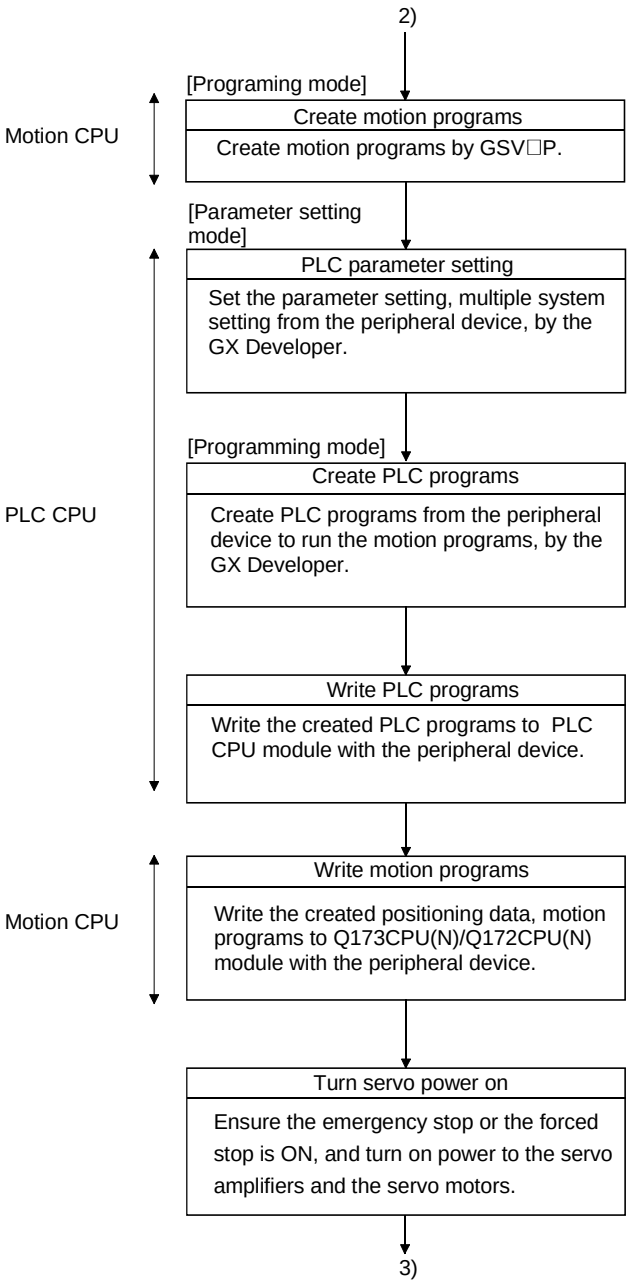
Table 5.1 Checklists before Trial Operation

Item	Performance specifications	Reference
Q173CPU(N)/Q172CPU(N) Motion CPU module	(1) Check that the battery lead connector is connected into the BAT connector of the Dividing unit correctly?	2.4.9
	(2) Check that the battery voltage is normal? (Normal value: 3.6V)	2.4.9 (1)
Q172LX Servo external signals interface module/	(1) Check that the installation position of the module corresponds to the system setting?	2.4.4 (5) 2.4.5 (7)
Q172EX Serial absolute synchronous encoder interface module/	(2) Check that the external equipment are connected to the Q172LX/Q172EX/ Q173PX correctly?	2.4.4 2.4.5 2.4.6
Q173PX Manual pulse generator interface module	(3) Check that the battery is connected to the battery connector?	6.4.2
	(4) Check that the battery voltage of the Q172EX is normal?	2.4.5 (8)
CPU base unit	(1) Check that the installation module models are correct?	2.4.3 (1)
	(2) Check that the installation orders are correct?	2.1.3
	(3) Check that the modules are installed correctly?	4.1.3 (1)
Power supply module	(1) Check that the power supply module model is correct?	2.4.2 (1)
	(2) Check that FG and LG are wired correctly?	4.6.2
	(3) Check that the terminal screws are tightened correctly?	4.1.1 (3)
	(4) Check that the cable sizes are correct?	4.5.1 (1)
I/O module	(1) Check that the cables connected to each terminal of the terminal block correspond to the signal names?	Refer to Q series I/O Module Type Building Block User's Manual
	(2) Check that the terminal screws are tightened correctly?	
	(3) Check that the cable sizes are correct?	
	(4) Check that the external power supply are connected correctly? (24 VDC, 5 VDC)	
Extension base unit	(1) Check that the installation module models are correct?	2.4.3 (1) (b)
	(2) Check that the total I/O points of the output module and special function module does not exceed the number I/O points of the CPU module?	2.4.1 (5)
	(3) Check that the installation modules are connected correctly?	4.1.3 (1)
SSCNET cable	(1) Check that the installation SSCNET cable models are correct?	2.4.8
	(2) Check that the installation position of the SSCNET cables are correct?	
	(3) Check that the SSCNET cables are connected correctly?	4.2.1
Dividing unit(Q173DV)	(1) Check that the installation SSCNET cable models are correct?	2.4.8
	(2) Check that the installation position of the SSCNET cables are correct?	
	(3) Check that the SSCNET cables are connected correctly?	
	(4) Check that the battery is connected to the battery connector?	6.4.2 (2)
Battery unit(Q170BAT)	(1) Check that the SSCNET cables are connected correctly?	2.4.8
	(2) Check that the battery is connected to the battery connector?	6.4.2 (2)

5.2 Trial Run and Adjustment Procedure




1)
Check external inputs to Q172LX
Check the wiring for the following external inputs by monitoring at a peripheral device.
(a) FLS ∗
(Upper limit switch input)
(b) RLS ∗
(Lower imit switch input)
(c) STOP ∗
(Stop command)
Refer to section 2.4.4
Check external inputs to Q172EX
Check the wiring for the following external inputs by monitoring at a peripheral device or using the LED indicators.
(a) Serial absolute synchronous encorder setting.
Refer to section 2.4.5
Motion CPU
Check external inputs to Q173PX
Check the wiring for the following external inputs by monitoring at a peripheral device or using the LED indicators.
(a) Mnual pulse generator/ incremental synchronous encorder setting.
Refer to section 2.4.6
I/O module setting
Check the I/O module type and wiring which the Motion CPU module controls.
[Servo data setting mode]
Positioning parameters setting
Set the following positioning parameters from the peripheral device.
(a) Fixed parameters
(b) Servo parameters
(c) Home position return data
(d) Limit switch
2)
⚠ CAUTION
● Do not install a phase advancing capacitor,surge absorber or radio noise filter (option FR-BIF) on the output side of the servo amplifier.
● Correctly connect the output side (terminal U, V, W). Incorrect connections will lead the servomotor to operate abnormally.
⚠ CAUTION
● Set parameter values to those that are compatible with the motion controller, servo amplifier, servomotor and regerative resistor model and the system application.
The protective functions may not function if the settings are incorrect.



⚠ CAUTION

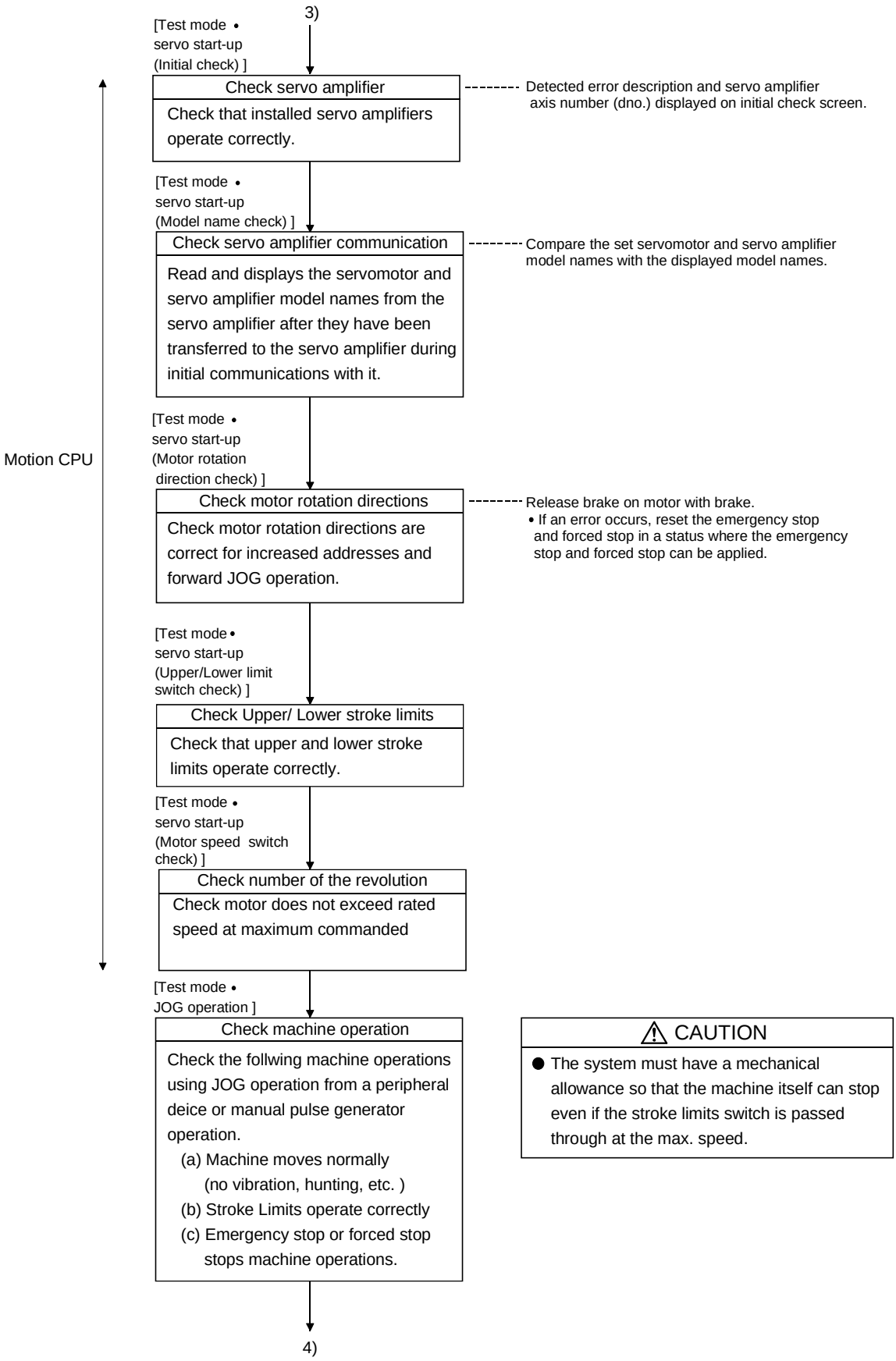
- Never open the front case or terminal cover at times other than wiring work or periodic inspections even if the power is OFF. The insides of the Motion controller and servo amplifier are charged and may lead to electric shocks.
- When performing wiring work or inspections, turn the power OFF, wait at least ten minutes, and then check the voltage with a tester, etc..
- Wire the units after installing the Motion controller, servo amplifier and servomotor. Failing to do so may lead to electric shocks or damage.

⚠ CAUTION

- Always install a leakage breaker on the Motion controller and servo amplifier power source.
- Install emergency stop circuit externally so that operation can be stopped immediately and the power shut off.
- Use the program commands for the program with the conditions specified in the instruction manual.
- Some devices used in the program have fixed applications, so use these with the conditions specified in the instruction manual.

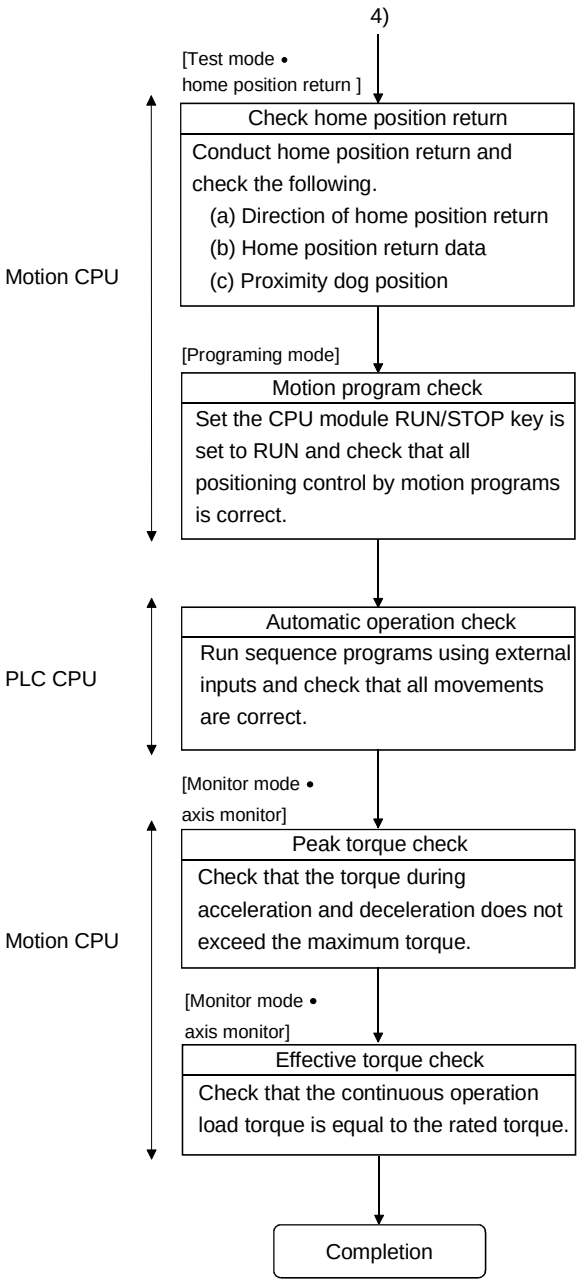
⚠ CAUTION

- If safety standards (ex., robot safety rules, etc.,) apply to the system using the Motion controller, servo amplifier and servomotor, make sure that the safety standards are satisfied.
- Construct a safty circuit externally of the Motion controller or servo amplifier if the abnormal operation of the Motion controller or servo amplifier differ from the safty directive operation in the system.



⚠ CAUTION

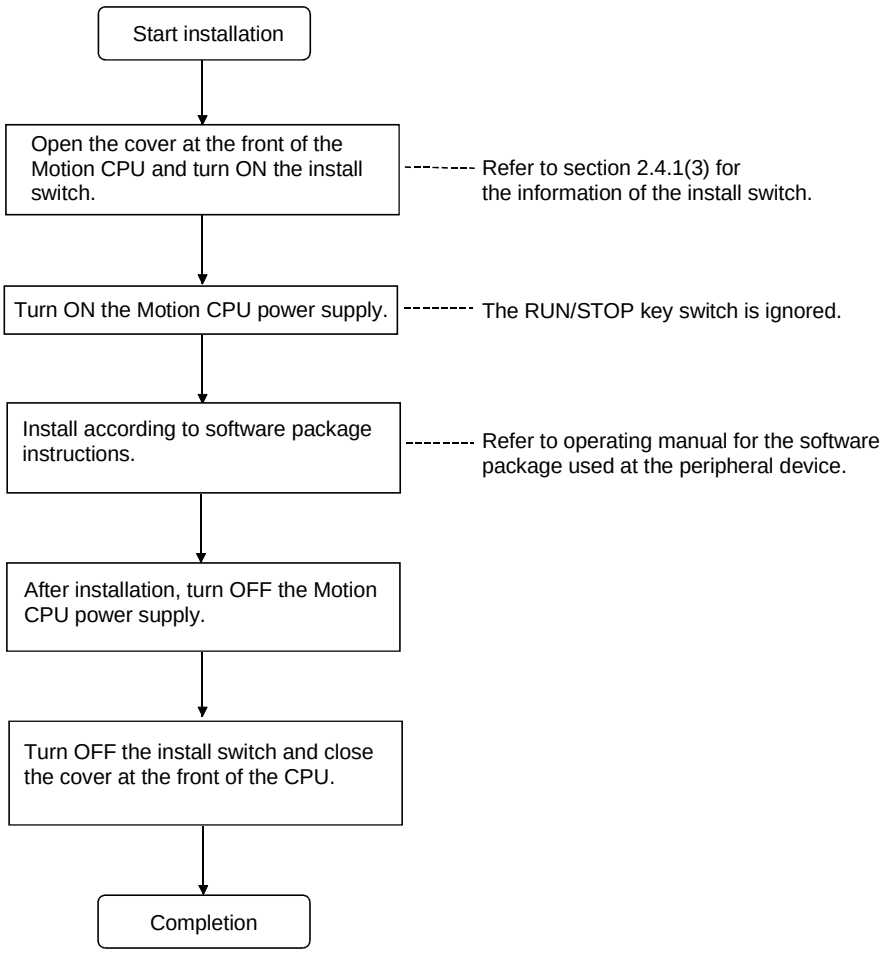
- The system must have a mechanical allowance so that the machine itself can stop even if the stroke limits switch is passed through at the max. speed.



POINTS
(1) Make note of motor module names before the motor is installed on a machine. The motor name plate may not be visible after the motor is installed. (2) When the servo amplifier, servomotor is first turned on, check the operation of each individual motor to prevent accidents.

5.3 Operating System Installation Procedure

In the Motion CPU module, the operating system (hereafter abbreviated to the OS) can be changed by using peripheral device and software package.
This OS change is called installation.



5.4 Trial Run and Adjustment Checklist

At the worksite, copy the following table for use as a check sheet.

Work Step	Item	Trial Run and Adjustment Confirmation	Check
Before power-on	Installation of unit/module and basic wiring	Check that each module is installed correctly.	☐
		Check that each connector is connected correctly.	☐
		Check each terminal screw for looseness.	☐
		Check that earth wires of power supply module, servo amplifiers, etc. are correct.	☐
		Check that motor wiring is correct.	☐
		Check that regenerative brake option wiring are correct.	☐
		Check that the emergency stop and forced stop circuit are correct.	☐
		Check that each power supply wire and each I/O wire are correct.	☐
Power-on, Motion CPU module in STOP status, PLC CPU module in STOP status	OS installation	Check that the Motion OS installation is compatible.	☐
	System setting	Check the system setting is correct.	☐
	Q172LX external signals	Check that upper and lower stroke limit inputs are correct.	☐
		Check that STOP signal input is correct.	☐
		Check that proximity dog and speed-position switching signal inputs are correct.	☐
	Program/positioning data	Check that motion program, PLC program and positioning data are stored in CPU module correctly.	☐
Motion CPU module in RUN status, PLC CPU module in STOP status	Basic axis operations (Check each axis)	Check that communications with the servo amplifiers can be made.	☐
		Check that rotation direction for JOG operation is correct.	☐
		Check that upper and lower limit switches operate correctly.	☐
		Check that rotation at maximum command speed is not more than motor rating.	☐
		Check that JOG operation moves machine correctly.	☐
		Check that a stop is effected at stroke limit.	☐
		Check that the emergency stop or forced stop is made.	☐
		Check that home position return is made correctly.	☐
		Check that each positioning control of motion program is exercised correctly.	☐
Motion CPU module in RUN status, PLC CPU module in RUN status	Manual operation	Check each operation in manual operation mode of system with motion program running.	
		Check that machine operation is stopped immediately by the emergency stop or forced stop.	☐
		Check operation of each actuator and operation confirmation limit switch.	☐
		Check that the emergency stop, forced stop and equipment alarm signals are given correctly.	☐
		Make other checks in compliance with control specifications specific to system and equipment.	☐
	Automatic operation	Check each operation in automatic operation mode of system with motion program running.	
		Check the automatic operation motions.	☐
		Check that machine operation is stopped immediately by the emergency stop or forced stop.	☐
		Check that module or equipment alarm causes an immediate stop or cycle stop.	☐
		Check that restoring operation can be performed after an alarm stop.	☐
		Make other checks in compliance with control specifications specific to system and equipment.	☐
	Torque check	Check the acceleration/deceleration torque is not more than maximum torque.	☐
		Check that continuous load torque is rated torque.	☐

6. INSPECTION AND MAINTENANCE

⚠ DANGER

- Do not touch the terminals while power is on. Doing so could cause shock.
- Correctly connect the battery. Also, do not charge, disassemble, heat, place in fire, short circuit, or solder the battery.
  Mishandling of a battery can cause overheating or cracks which could result in injury and fires.
- Turn off the all lines of the power supply externally when cleaning the module, tightening the terminal screws or module fixing screws. Not doing so could result in electric shocks.
  Loose terminal screws may cause short circuits or malfunctions.
  Failure to install the module correctly will result in short circuit, malfunction or in the module falling.

⚠ CAUTION

- In order to ensure safe operation, read the manual carefully to acquaint yourself with procedures for program change, forced outputs, RUN, STOP, and PAUSE operations, etc., while operation is in progress.
  Operation mistakes could cause damage to the equipment and other problems.
- Never try to disassemble or modify module. It may cause product failure, malfunction, fire or cause injury.
- When using cellular phone, keep them away from the Motion controller 25 cm (9.84 inch) or more. It may cause a malfunction.
- Turn off the all lines of the power supply externally when installing or removing the modules.
  Not doing so could damage the module or result in erroneous operation.

In order that you can use the Motion controller in normal and optimal condition at all times, this section describes those items that must be maintained or inspected daily or at regular intervals.

6.1 Maintenance Works

6.1.1 Inspection and maintenance

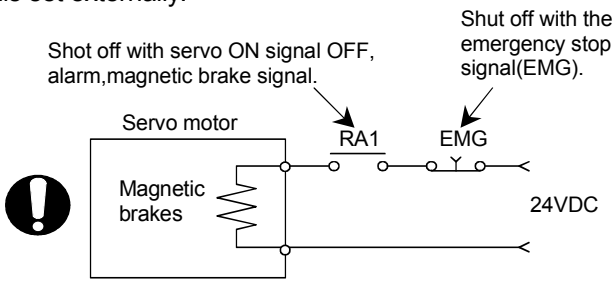
In order that can use the Motion controller in safety and normal, those items that must be inspected list below.

⚠ CAUTION

- Never open the front case or terminal covers while the power is ON or the unit is running, as this may lead to electric shocks.
- Never run the unit with the front case or terminal cover removed. The high voltage terminal and charged sections will be exposed and may lead to electric shocks.
- Never open the front case or terminal cover at times other than wiring work or periodic inspections even if the power is OFF. The insides of the Motion controller and servo amplifier are charged and may lead to electric shocks.
- When performing wiring work or inspections, turn the power OFF, wait at least ten minutes, and then check the voltage with a tester, etc.. Failing to do so may lead to electric shocks.
- Be sure to ground the Motion controller, servo amplifier and servomotor. Do not ground commonly with other devices. (Ground resistance : 100 Ω or less)
- The wiring work and inspections must be done by a qualified technician.
- Wire the units after installing the Motion controller, servo amplifier and servomotor. Failing to do so may lead to electric shocks or damage.
- Never operate the switches with wet hands, as this may lead to electric shocks.
- Do not damage, apply excessive stress, place heavy things on or sandwich the cables, as this may lead to electric shocks.
- Do not touch the Motion controller, servo amplifier or servomotor terminal blocks while the power is ON, as this may lead to electric shocks.
- Do not touch the internal power supply, internal grounding or signal wires of the Motion controller and servo amplifier, as this may lead to electric shocks.
- Perform the daily and periodic inspections according to the instruction manual.
- Perform maintenance and inspection after backing up the program and parameters for the Motion controller and servo amplifier.
- Do not place fingers or hands in the clearance when opening or closing any opening.
- Periodically replace consumable parts such as batteries according to the instruction manual.
- Do not touch the lead sections such as ICs or the connector contacts.
- Do not place the Motion controller or servo amplifier on metal that may cause a power leakage or wood, plastic or vinyl that may cause static electricity buildup.
- Do not perform a megger test (insulation resistance measurement) during inspection.
- When replacing the Motion controller or servo amplifier, always set the new unit settings correctly.
- After maintenance and inspections are completed, confirm that the position detection of the absolute position detector function is correct.

⚠ CAUTION

- Do not short circuit, charge, overheat, incinerate or disassemble the batteries.
- The electrolytic capacitor will generate gas during a fault, so do not place your face near the Motion controller or servo amplifier.
- The electrolytic capacitor and fan will deteriorate. Periodically change these to prevent secondary damage from faults. Replacements can be made by our sales representative.
- If an error occurs in the self diagnosis of the Motion controller or servo amplifier, confirm the check details according to the instruction manual, and restore the operation.
- If a dangerous state is predicted in case of a power failure or product failure, use a servomotor with magnetic brakes or install a brake mechanism externally.
- Use a double circuit construction so that the magnetic brake operation circuit can be operated by emergency stop signals set externally.



- If an error occurs, remove the cause, secure the safety and then resume operation after alarm release.
- The unit may suddenly resume operation after a power failure is restored, so do not go near the machine. (Design the machine so that personal safety can be ensured even if the machine restarts suddenly.)
- Confirm and adjust the program and each parameter before operation. Unpredictable movements may occur depending on the machine.
- Extreme adjustments and changes may lead to unstable operation, so never make them.
- Do not apply a voltage other than that specified in the instruction manual on any terminal. Doing so may lead to destruction or damage.
- Do not mistake the terminal connections, as this may lead to destruction or damage.
- Do not mistake the polarity (+ / -), as this may lead to destruction or damage.
- Do not touch the servo amplifier's heat radiating fins, regenerative resistor and servomotor, etc., while the power is ON and for a short time after the power is turned OFF. In this timing, these parts become very hot and may lead to burns.
- Always turn the power OFF before touching the servomotor shaft or coupled machines, as these parts may lead to injuries.
- Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.
- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other. They should be installed 100 mm (3.94 inch) or more from each other. Trying to bunch or install could result in noise that would cause erroneous operation.

6.2 Daily Inspection

The items that must be inspected daily are listed below.

Table 6.1 Daily Inspection

Item	Inspection item			Inspection	Criterion	Action
1	Installation condition of the base unit			Check that fixing screws are not loose and the cover is not dislocated.	The screws and cover must be installed correctly.	Further tighten the screws.
2	Installation condition of the I/O module			Check that the module is not dislocated and the hook is engaged correctly.	The hook must be engaged and installed correctly.	Correctly engaged the hook.
3	Connection condition			Check that terminal screws are not loose.	Terminal screws must not be loose.	Further tighten terminal screws.
				Proximity of solderless terminals to each other	Solderless terminals must be positioned at proper intervals.	Correct.
				Connectors of extension cable	The connector must not be loose.	Further tighten connector fixing screws.
4	Module indication lamp	Power supply module	Power supply [POWER] LED	Check lit.	Lit(green) : Normal (Abnormal if the LED turned OFF.)	Refer to "QCPU (Q Mode) User's Manual(Function Explanation /Program Funda-mentals)".
		PLC CPU module	CPU [RUN] LED	Check lit in RUN state.	Lit : PLC CPU started (Abnormal if the LED turned OFF.)	
			CPU [ERR.] LED	Check not lit.	Not lit : Normal (Abnormal if the LED turning ON or flashing.)	
			CPU [USER] LED	Check lit.	Lit : When occurs CHK state or annunciators ON.[F]	
			CPU [BOOT] LED	Check lit/not lit.	Lit : ROM operating mode Not lit : RAM operating mode/ Installation • ROM writing mode	
			CPU [BAT.] LED	Check not lit.	Not lit : Normal (Abnormal if the LED turning ON.)	
		Motion CPU module	CPU [MODE] LED	Check lit.	Lit(green) : Normal Lit(orange) : Installation • ROM writing mode (Abnormal if the LED turned OFF.)	Refer to section 2.4.1
			CPU [RUN] LED	Check lit.	Lit : Normal (Abnormal if the LED turned OFF.)	
			CPU [ERR.] LED	Check not lit.	Not lit : Normal (Abnormal if the LED turning ON or flashing.)	
			CPU [M.RUN] LED	Check lit in RUN state.	Lit : Operation in motion control. (Abnormal if the LED turned OFF.)	
			CPU [BAT.] LED	Check not lit.	Not lit : Normal (Abnormal if the LED turning ON.)	

Daily Inspection(continued)

Item	Inspection item			Inspection	Criterion	Action
4	Module indication lamp	I/O module	Input LED	Check lit/not lit.	Lit : Input signal ON Not lit : Input signal OFF (Abnormal if the LED does not turning ON or turn OFF as indicated above.)	Refer to section 2.4.1
			Output LED	Check lit/not lit.	Lit : Output signal ON Not lit : Output signal OFF (Abnormal if the LED does not turning ON or turn OFF as indicated above.)	
5	Cooling fan unit (Q173CPU/Q172CPU only)			Check vibration, howl and noise.	No vibration, howl and noise. (The service life time of the Cooling fan unit, when the number of the revolution lower than the 20% of the fast time.)	If a service life time of the Cooling fan unit is exceeded, replace it with a new one.

6.3 Periodic Inspection

The items that must be inspected one or two times every 6 months to 1 year are listed below.
When the equipment is moved or modified, or layout of the wiring is changed, also implement this inspection.

Table 6.2 Periodic Inspection

Item	Inspection item		Inspection	Criterion	Action
1	Ambient environment	Ambient temperature	Measure with a thermometer and a hygrometer. Measure corrosive gas.	0 to 55 °C (32 to 131 °F)	If the Multiple CPU system is used in the control panel, temperature within the control panel is equivalent to ambient temperature.
		Ambient humidity		5 to 95 % RH	
		Atmosphere		No corrosive gases	
2	Power voltage		Measure a voltage across the terminals of 100/200VAC and 24VDC.	85 to 132VAC	Change the power supply.
				170 to 264VAC	
				15.6 to 31.2VDC	
3	Installation	Looseness, rattling	Move the module to check for looseness and rattling.	The module must be installed fixedly.	Further tighten screws. If the CPU, I/O, or power supply module is loose, fix it with screws.
		Adhesion of dirt and foreign matter	Check visually.	Dirt and foreign matter must not be present.	Remove and clean.
4	Connection	Looseness of terminal screws	Try to further tighten screws with a screwdriver.	Screws must not be loose.	Further tighten.
		Proximity of solderless terminals to each other	Check visually.	Solderless terminals must be positioned at proper intervals.	Correct.
		Looseness of connectors	Check visually.	Connectors must not be loose.	Further tighten connector fixing screws.
5	Battery		Preventive maintenance		Even if the lowering of a battery capacity is not shown, replace the battery with a new one if a service life time of the battery is exceeded.
6	Cooling fan unit (Q173CPU/Q172CPU only)		Check visually.	No vibration, howl and noise. (The service life time of the Cooling fan unit, when the number of the revolution lower than the 20% of the fast time.)	If a service life time of the Cooling fan unit is exceeded, replace it with a new one.

6.4 External Battery

The special relays M9006 and M9007 are ON due to the Motion CPU program or the decrease in voltage of memory back-up battery.
Even if these special relays are ON, the program and the contents of memory back-up are not erased immediately.
If the energization of these relays is recognized, these contents may be deleted unintentionally.
While a total of the memory back-up time after the M9006, M9007 are ON is within a specified time, replace the battery with a new one.

POINTS
M9007 is ON due to the decrease in voltage of memory back-up battery. Even if M9007 is ON, it holds the data within a specified time. However, for safety, replace the battery with a new one as soon as possible.

When the battery voltage of the Motion CPU module is lowered, the M9006 and M9007 are ON.
M9006 is turned on when battery voltage reduces to less than specified at all the time, but turned off when battery voltage becomes normal.
M9007 is turned on when battery voltage reduces to less than specified, it is not keeping alarm when Multiple CPU system is restart the power or reset.
Set the system settings, the external battery is using or not.

6.4.1 Battery service life time

(1) Q173CPU(N)/Q172CPU(N), Q172EX module battery service life time

The battery service life time corresponding to the type is shown below.

Type	Classification		Battery service life time (Total power interrupt time) [h] (Note-1)		
			Guaranteed time (MIN)	Actual time (TYP)	After the battery error
Q173CPU(N)/ Q172CPU(N)	Internal (Type of the rechargeable)	Charging time of 8 hours or more	200	500	No error detection
		Charging time of 40 hours or more	1100	4300	
	External(A6BAT/MR-BAT) (Note-2)		60000	240000	120 (After M9006, M9007 on)
Q172EX	Built in (A6BAT/MR-BAT)	MR-HENC×1	10000	30000	40 (After Error code 1152)
		MR-HENC×2	5000	15000	

(Note-1) : The actual time in use means the averaged time, and the guaranteed time means the minimum time.

(Note-2) : The external battery for Q173CPU(N) is installed to the Dividing unit(Q173DV).
The external battery for Q172CPU(N) is installed to the Battery unit(Q170BAT).

The service life time of the A6BAT/MR-BAT is 4 to 5 years when it is connected to the Q173CPU(N)/Q172CPU(N), Q172EX and the total of power interrupt time does not exceed the guaranteed value specified.
If a total of power interrupt time exceeds the guaranteed value specified above the M9006, M9007 is turned on, replace the battery with a new one immediately.

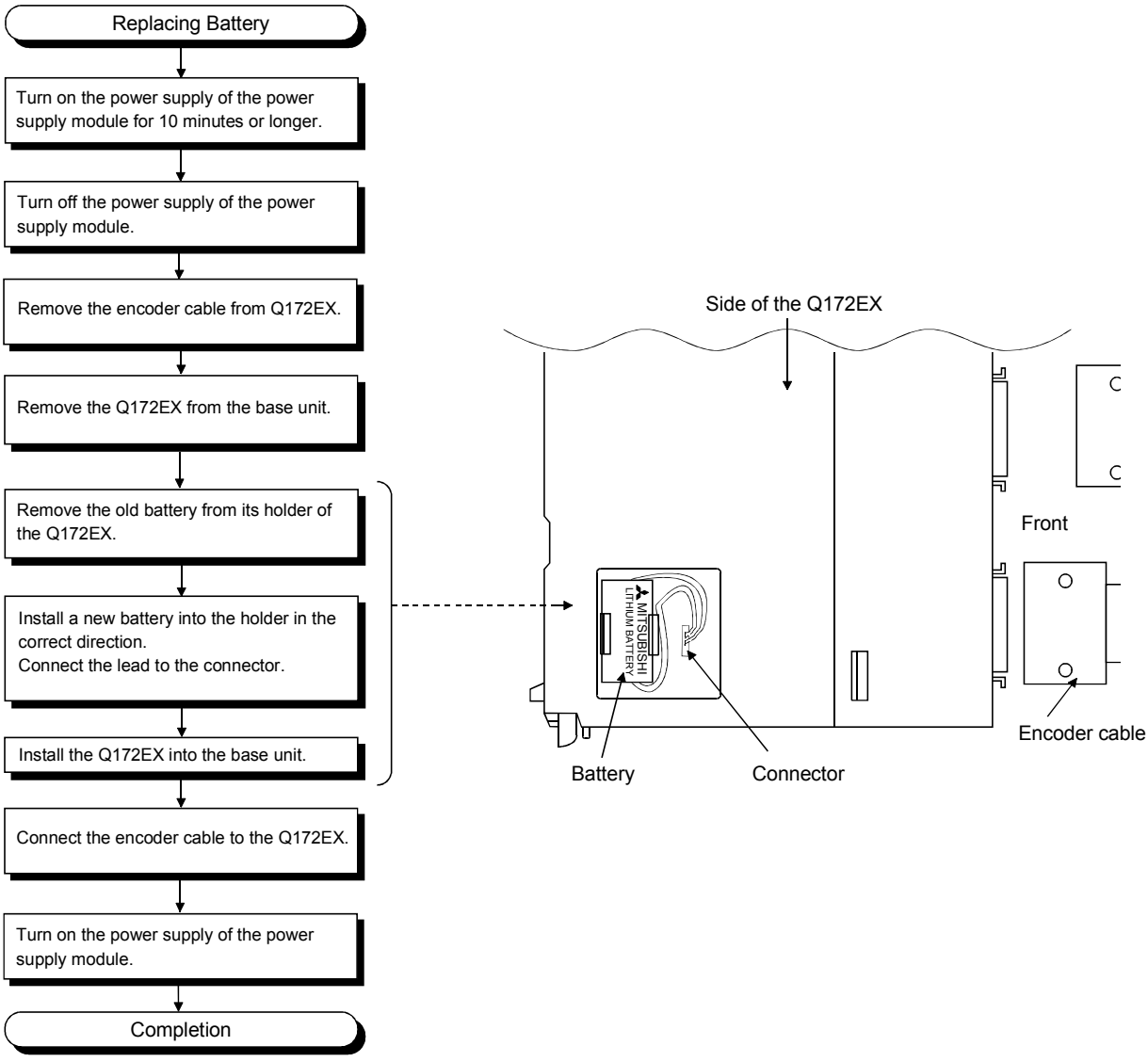
6.4.2 Battery replacement procedure

(1) Q172EX module battery replacement procedure

When the Q172EX module battery has been exhausted, replace the battery with a new one in accordance with the procedure shown below. Before removing the battery, turn ON the power supply for 10 minutes or longer.
Even when the battery is removed, the memories are backed up by the capacitor for a while. However, if the replacement time exceeds the guaranteed value specified in the table below, the contents stored in the memories may be erased. To prevent this trouble, replace the battery speedily.

Backup time by capacitor

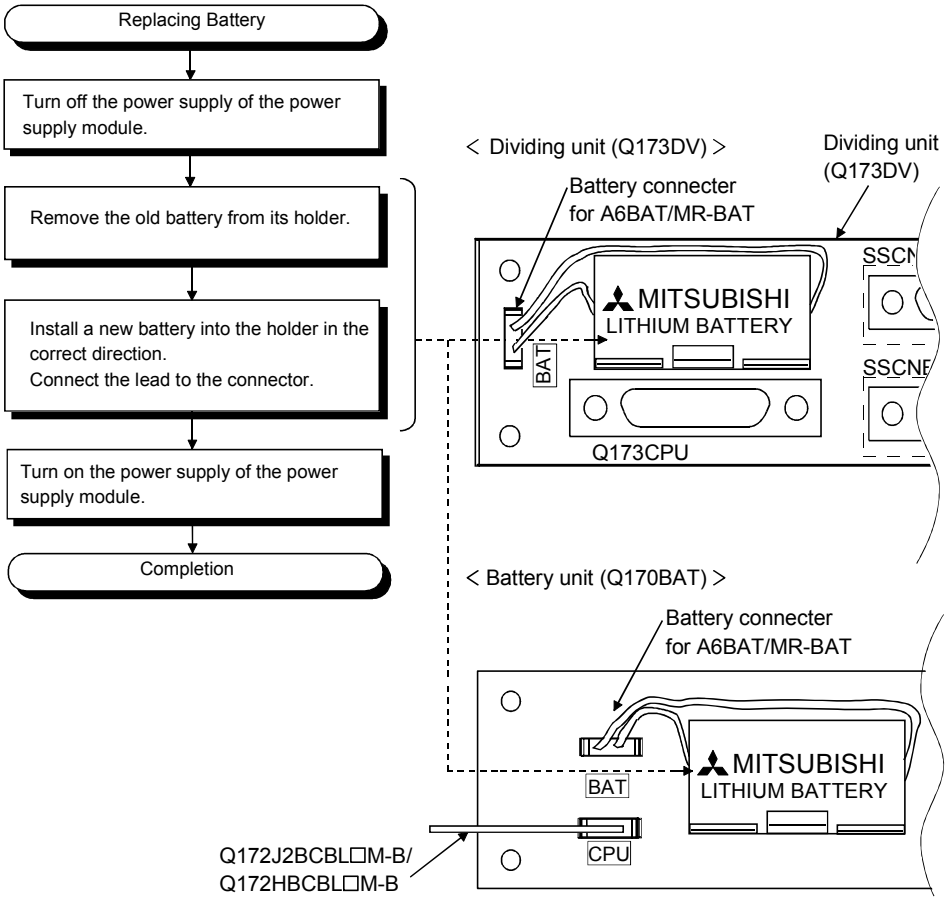
Backup time by capacitor[min]
3



(2) Battery replacement procedure of the Dividing unit, Battery unit

When the battery has been exhausted, replace the battery with a new one in accordance with the procedure shown below.

POINTS
Replace the battery taking care of the following. (a) Start the replacement operation after backing up the data to the personal computer which is installed the GSV □P. (b) Firstly back up the data stored in the Motion CPU to the personal computer which is installed the GSV □P then replace the battery with a new one. After installation, the battery in the Dividing unit or Battery unit verify the backing up the data to the personal computer which is installed the GSV □P and the data in the Motion CPU module, confirm the data is not changing.



6.5 Troubleshooting

This section describes the various types of trouble that occur when the system is operated, and causes and corrective actions of these troubles.

6.5.1 Basics of troubleshooting

In order to increase the reliability of the system, not only highly reliable devices are used but also the speedy startup of the system after the occurrence of trouble becomes an important factor.
To start up the system speedily, the cause of the trouble must be located and eliminated correctly.
The basic three points that must be followed in the troubleshooting are as follows.

(1) Visual inspection

Visually check the following.

1) Movement of machine (stopped condition, operating condition)
2) Power supply on/off
3) State of I/O devices
4) Installation condition of the Power supply module, Q173CPU(N)/Q172CPU(N) module, QCPU module, I/O module, Q172LX/Q172EX/Q173PX Motion module, SSCNET cable and Synchronous encoder cable.
5) State of wiring (I/O cables, cables)
6) Display states of various types of indicators (MODE LED, RUN LED, M.RUN LED, ERR. LED, I/O LED,etc.)
7) States of setting of various types of set switches (Number of extension bases setting, memory back-up, etc.)

After confirming items 1) to 7), Motion CPU module connect the SW6RN-GSV□P, PLC CPU module connect the GX Developer and check the operating conditions of the servomotors and the error code.

(2) Check of trouble

Check to see how the operating condition varies while the Motion controller is operated is operated as follows.

1) Set the RUN/STOP switch to STOP.
2) Reset the trouble with the RESET/L.CLR switch.
3) Turn ON and OFF the power supply.

(3) Reduction in area

Estimate the troubled part in accordance with items (1) and (2) above.

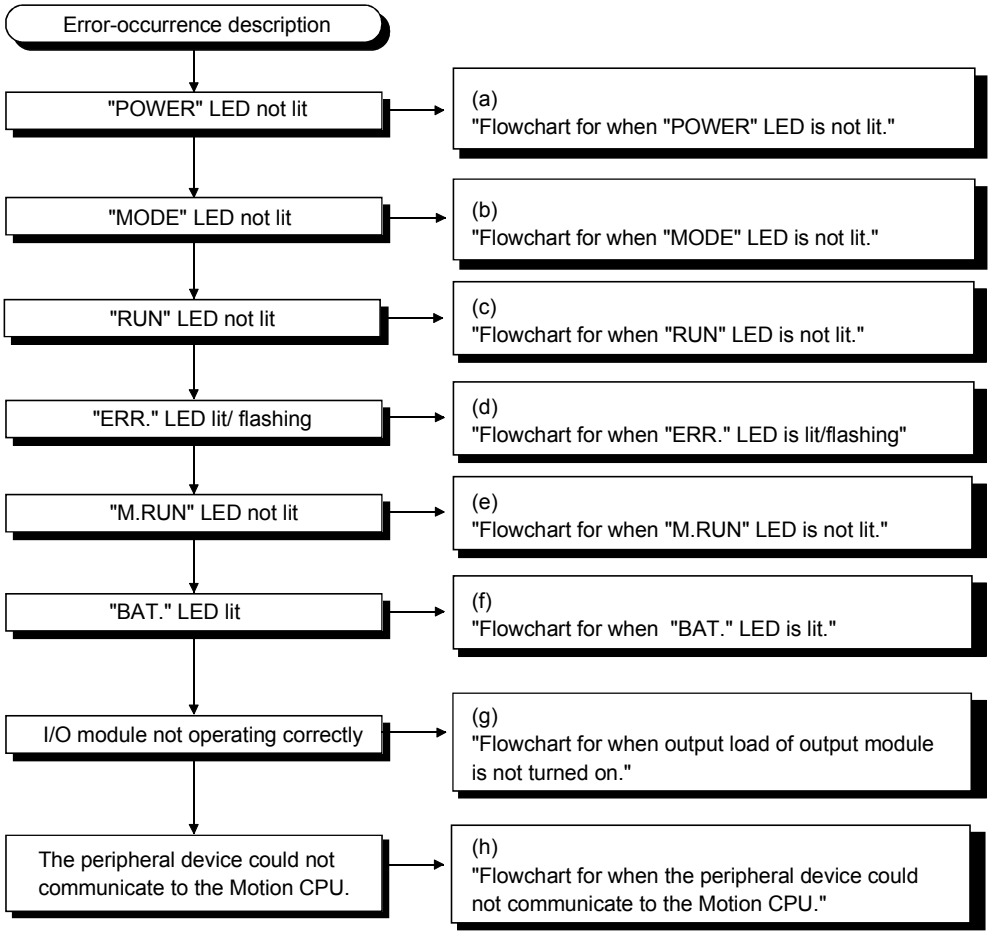
1) Multiple CPU system or external devices?
2) Motion CPU or PLC CPU?
3) I/O module or others?
4) Servo program or Motion SFC program?
5) PLC program?

6.5.2 Troubleshooting of Motion CPU module and I/O modules

This section describes the contents of troubles for the error codes and corrective actions of the troubles.
As for troubleshooting of PLC CPU, refer to the QCPU (Q mode) User's Manual(Function Explanation/Program fundamentals) of their respective modules.

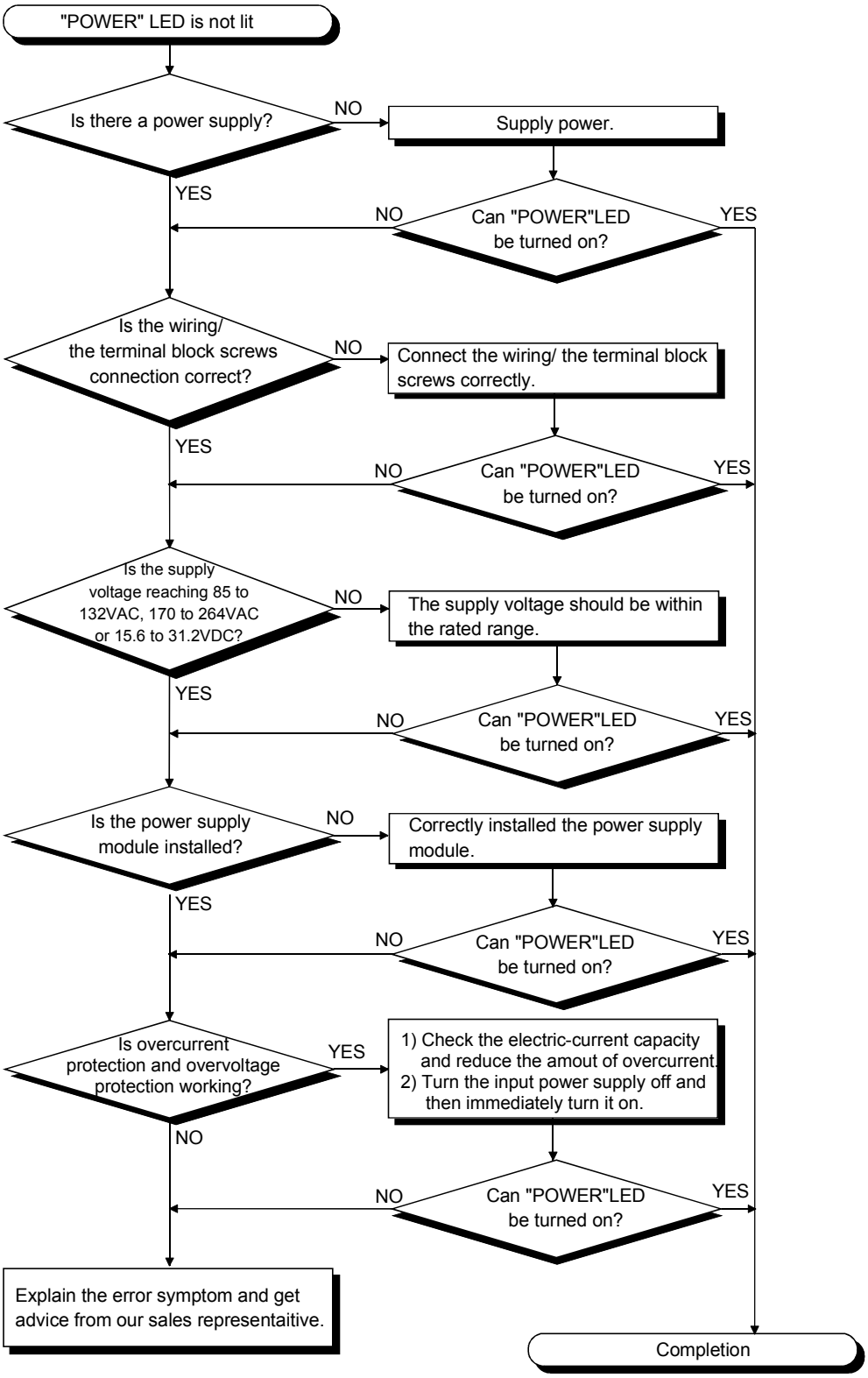
(1) Troubleshooting flowchart

The followings show the contents of the troubles classified into a variety of groups according to the types of events.



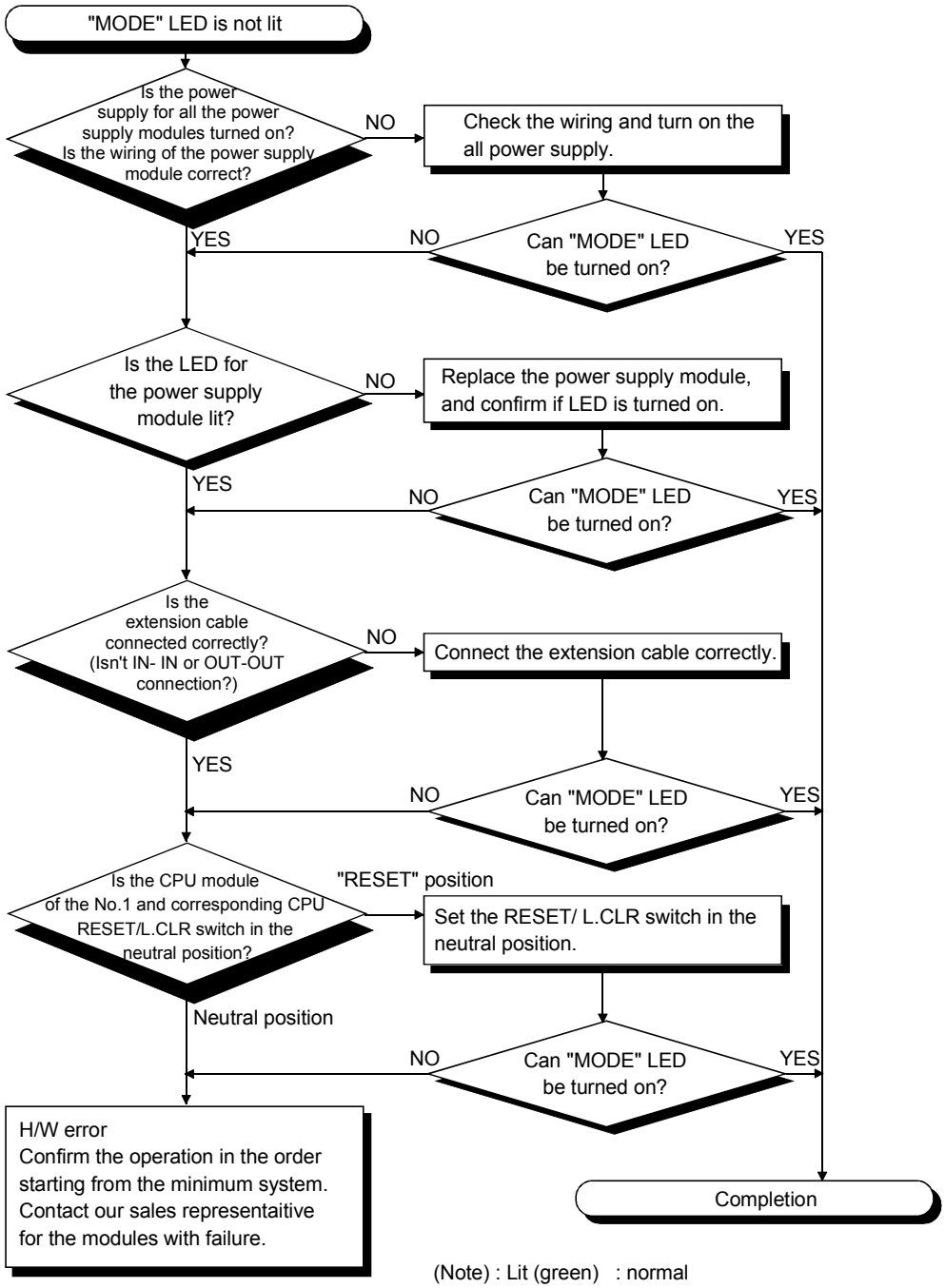
(a) Flowchart for when "POWER" LED is not lit.

The following shows the flowchart when the "POWER" LED is not lit, when the power supply is turned on and the during the operation.



(b) Flowchart for when "MODE" LED is not lit

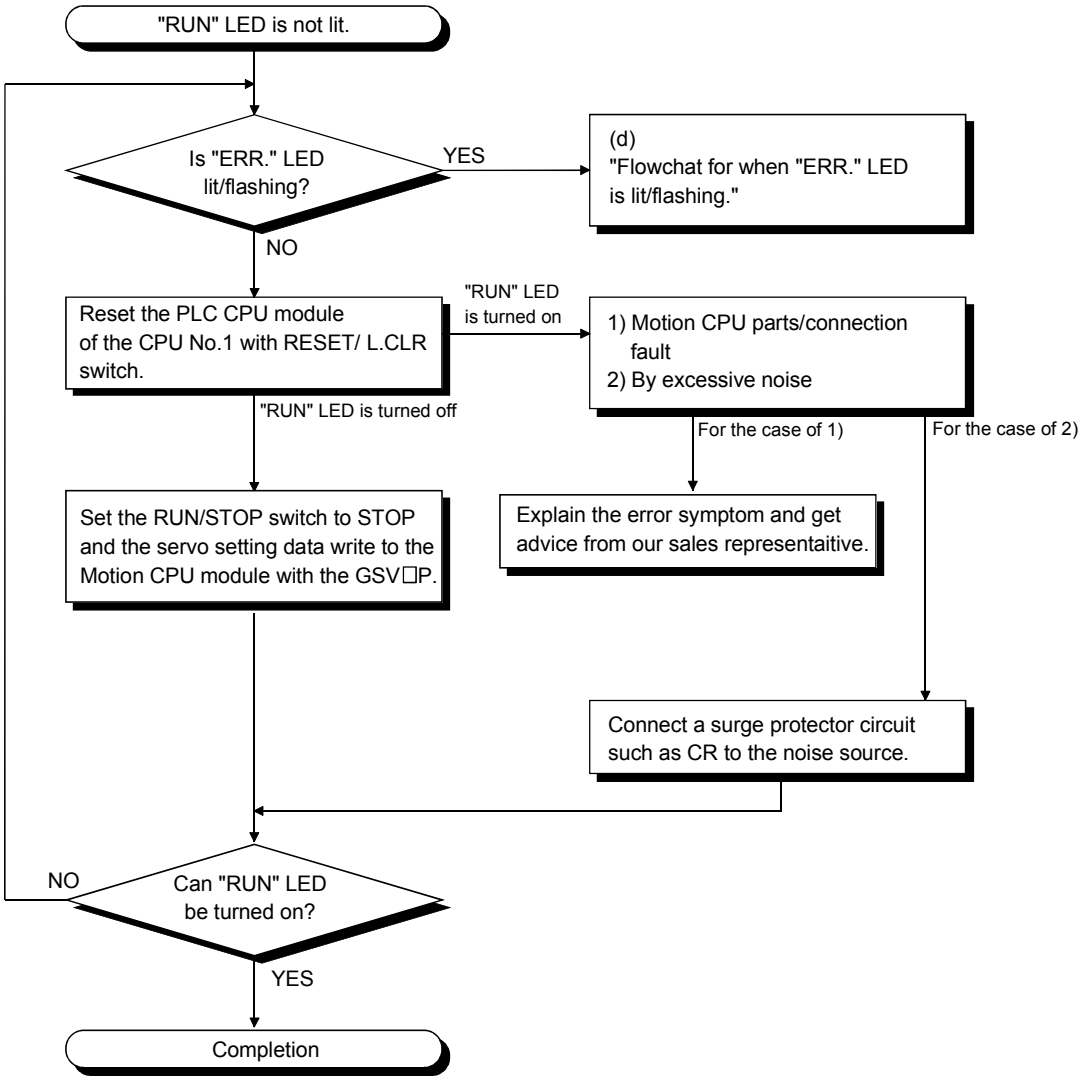
The following shows the flowchart when the "MODE" LED is not lit, when the power supply is turned on.



(Note) : Lit (green) : normal
Lit (orange) : Installation•ROM writing mode

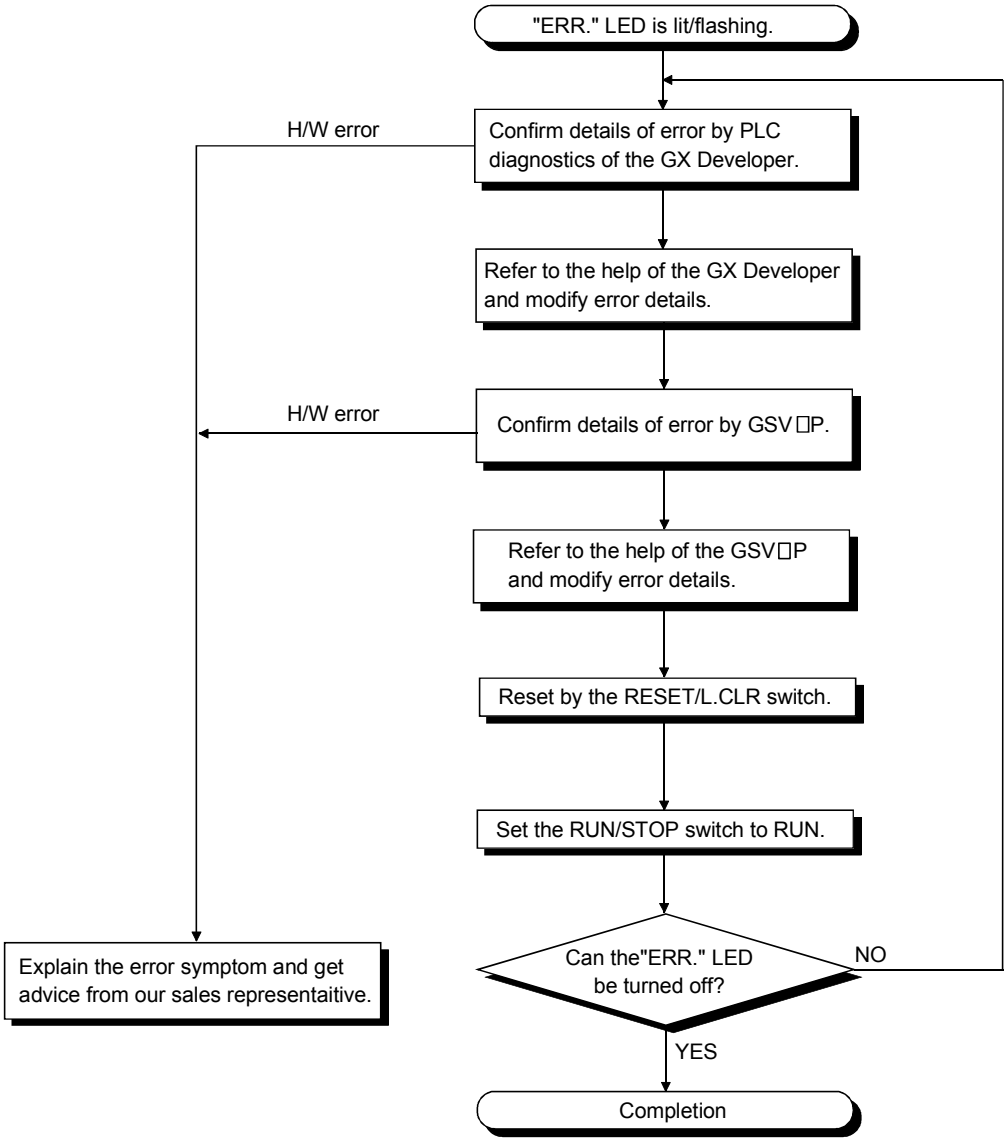
(c) Flowchart for when "RUN" LED is not lit

The following shows the flowchart when the "RUN" LED is not lit during the operation.



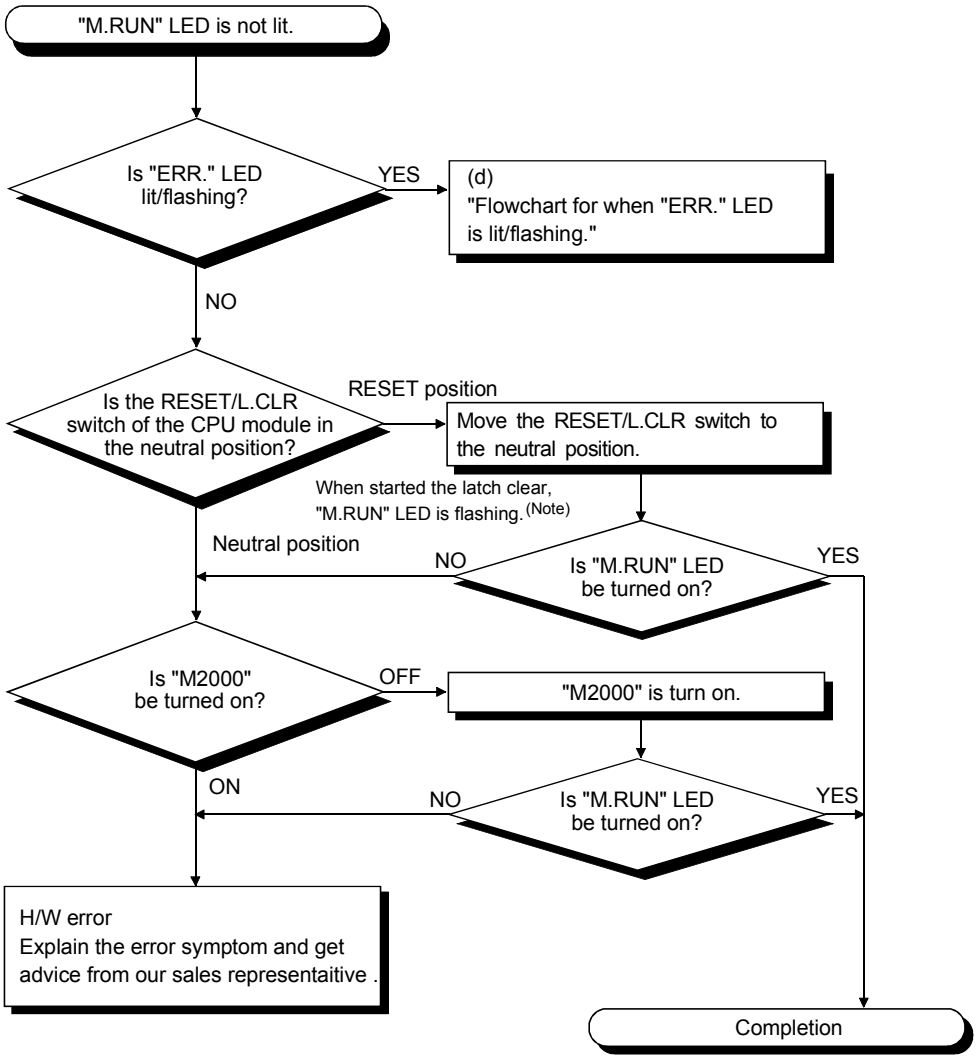
(d) Flowchart for when "ERR." LED is lit/flashing

The following shows the flowchart to be followed when the "ERR." LED is lit/flashing when the power supply is not lit, during the operation or the operation's started.



(e) Flowchart for when "M.RUN" LED is not lit

The following shows the flowchart when the "M.RUN" LED is not lit during the operation.

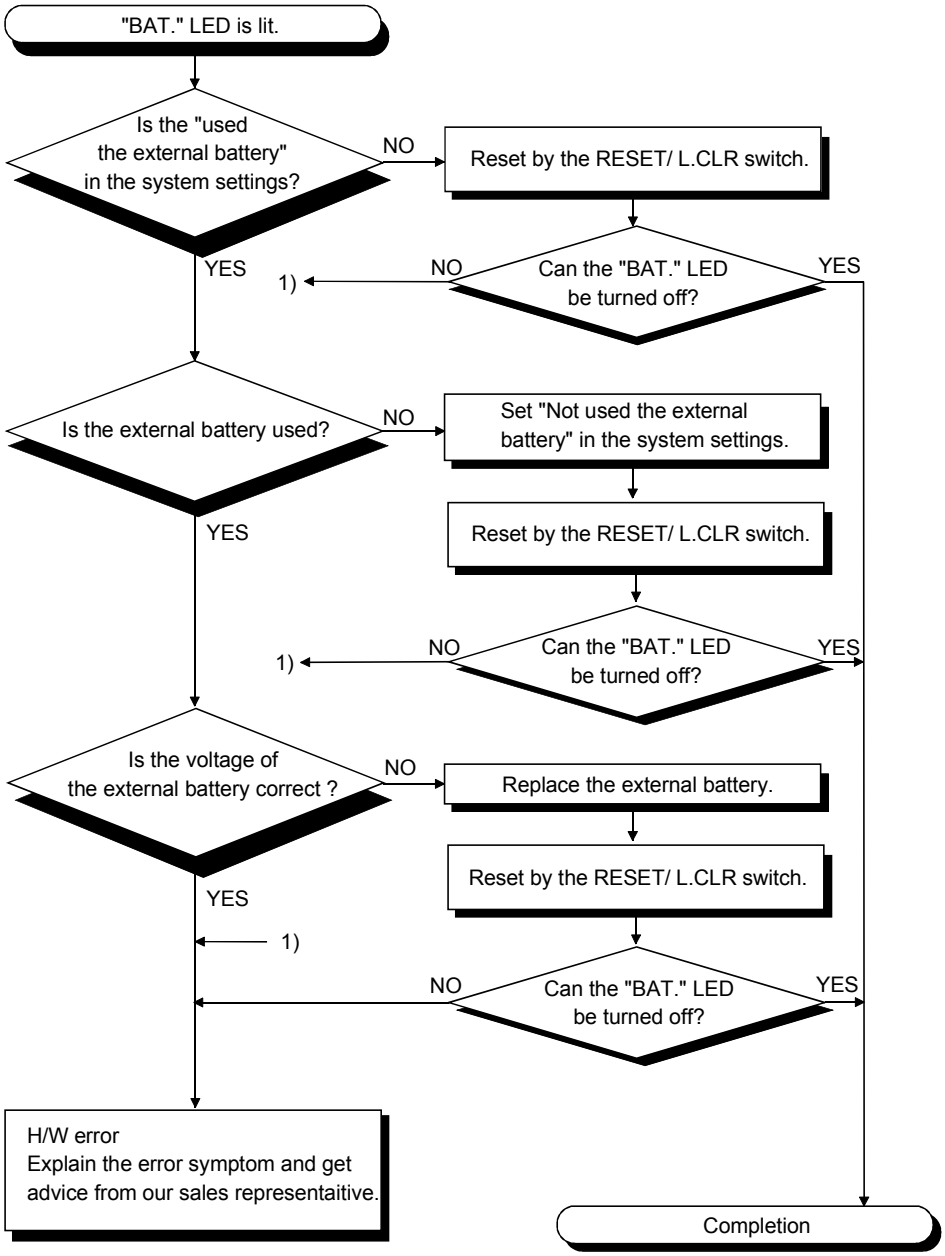


REMARK

(Note) : When the RUN/STOP switch is stop position and the RESET/L.CLR several times for latch clear operation, the "M.RUN" LED flashes to indicate that the latch clear processing is under operation.
When the RESET/L.CLR switch is further tilted to L.CLR while the "M.RUN" LED flashes, "M.RUN" LED turned off and terminates the latch clear processing.

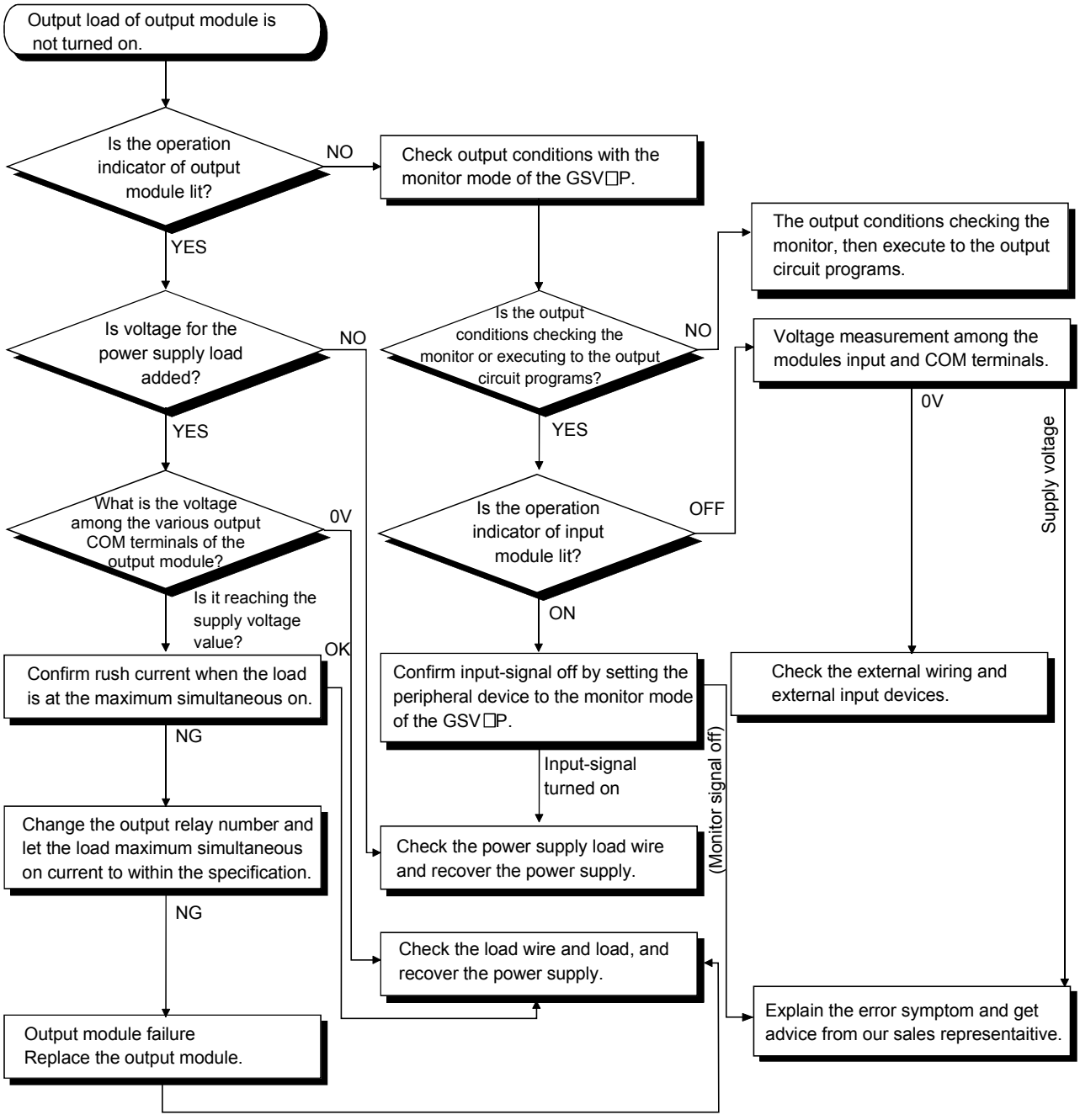
(f) Flowchart for when "BAT." LED is lit

In the Motion CPU, when the external battery capacity of the Dividing unit or Battery unit is lowered, the LED is turned on.
After replacing the battery with a new one, "BAT." LED is turned off with the executing reset by the RESET/L.CLR switch.
When it is selected "used the external battery", though the external battery is not used, the LED is also turned on.



(g) Flowchart for when output load of output module is not turned on

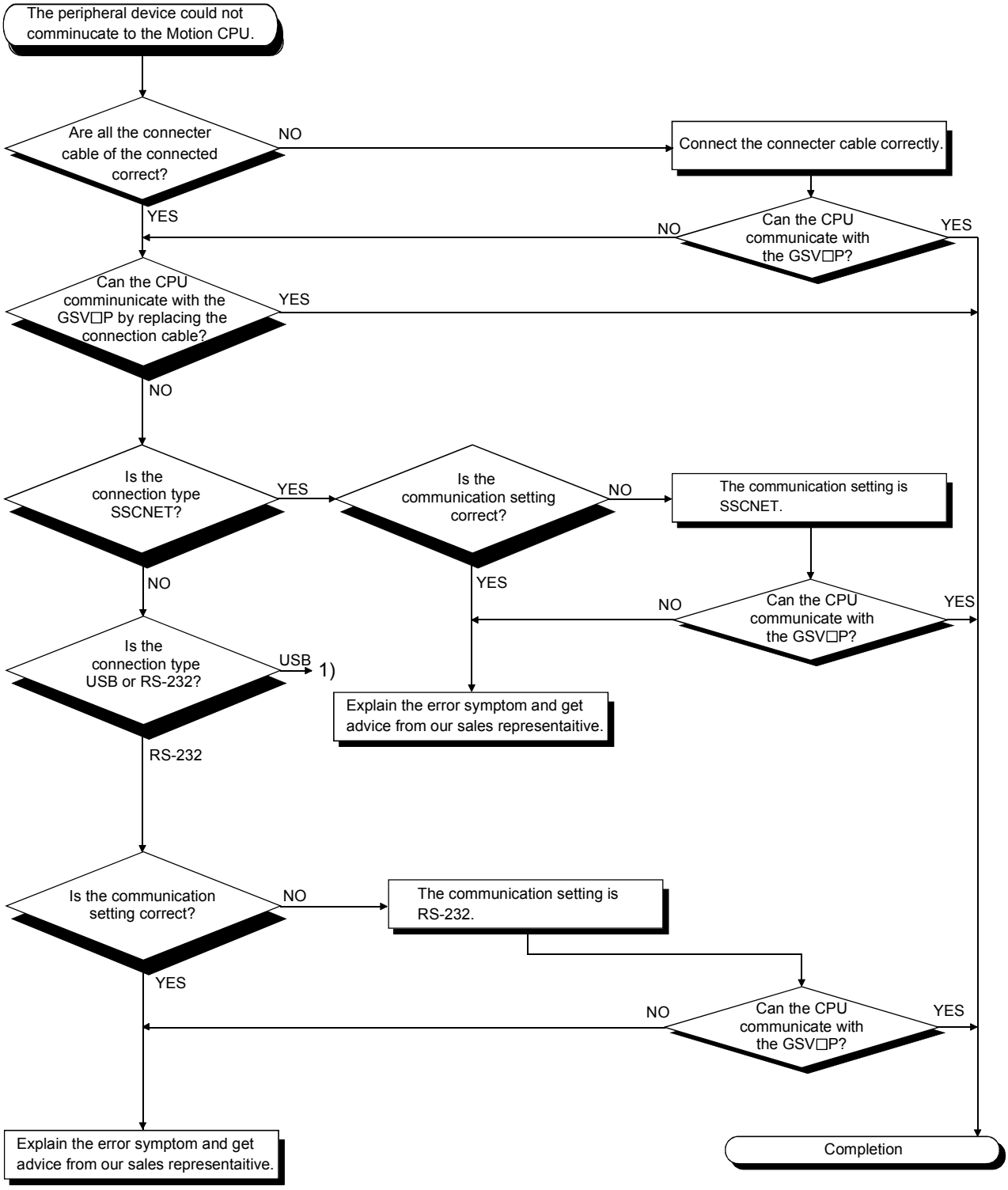
The following shows the flowchart that must be followed when the output load of the output module is not turned on during the operation.

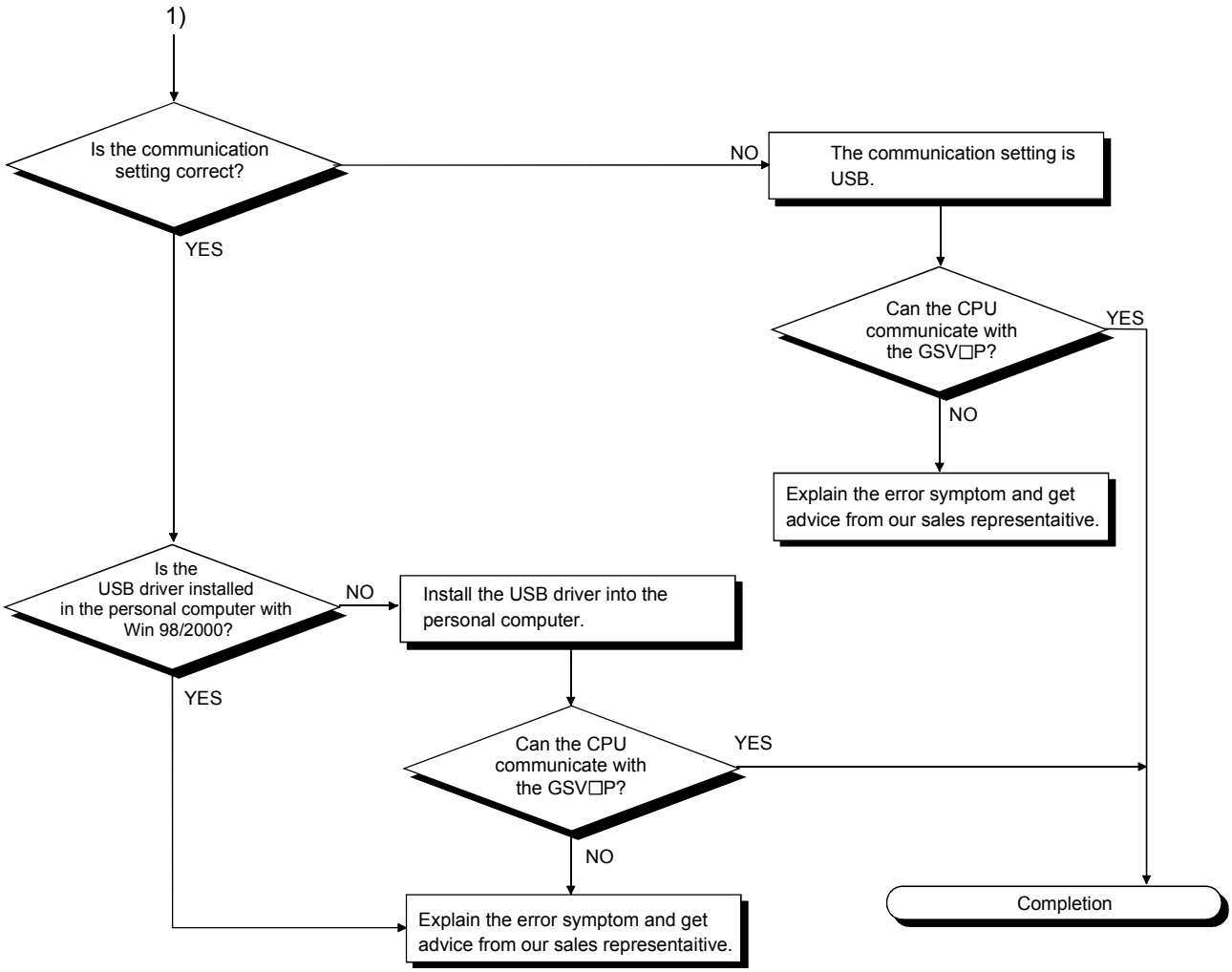


POINT
For information about input signal to the input module is not turned off, refer to section 6.5.3 Examples of troubles with I/O modules.

(h) Flowchart for when the peripheral device could not communicate to the Motion CPU

The following shows the flowchart when the Motion CPU could not communicate with the GSV□P during the power supply on.




1)
Is the communication setting correct?
NO
The communication setting is USB.
YES
Can the CPU communicate with the GSV□P?
YES
NO
Explain the error symptom and get advice from our sales representaitive.
Is the USB driver installed in the personal computer with Win 98/2000?
NO
Install the USB driver into the personal computer.
YES
Can the CPU communicate with the GSV□P?
YES
NO
Completion
Explain the error symptom and get advice from our sales representaitive.

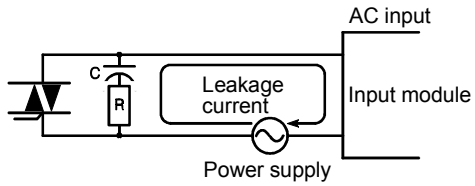
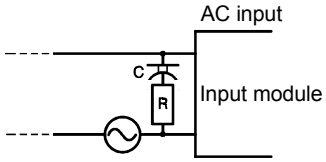
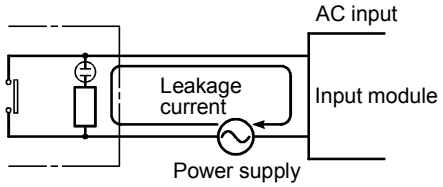
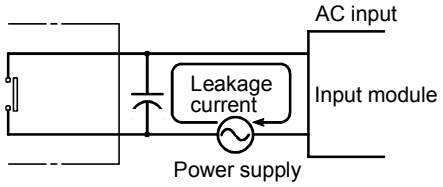
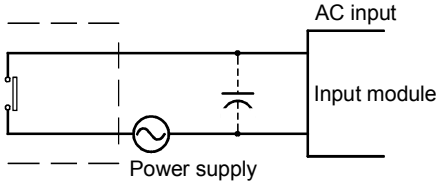
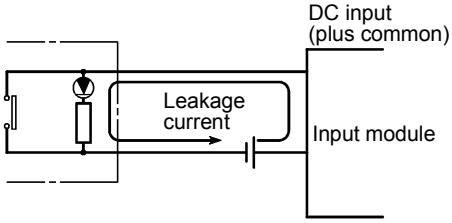
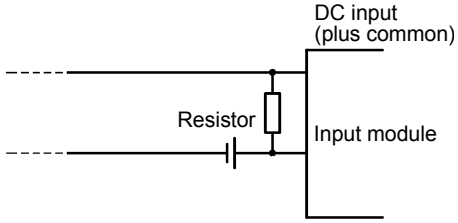
6.5.3 I/O modules troubleshooting

This section describes possible problems with I/O circuits and their corrective actions.

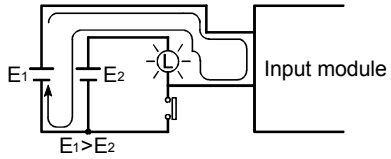
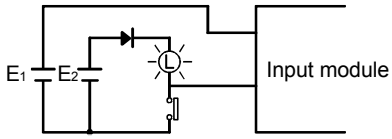
(1) Input circuit troubleshooting and corrective action

This section describes troubleshooting with input circuits and their corrective actions.

Input Circuit Troubleshooting and Corrective Action

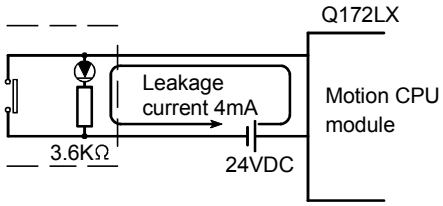
	Condition	Cause	Corrective action
Example 1	Input signal does not turn OFF.	• Leakage current of input switch (e.g. drive by non-contact switch). 	• Connect an appropriate resistor which will make the voltage across the terminals of the input module lower than the OFF voltage value.  It is recommended to use 0.1 to 0.47μF + 47 to 120Ω (1/2W) for the CR constant.
Example 2	Input signal does not turn OFF.	• Drive by a limit switch with neon lamp. 	• Same as Example 1. • Or make up another independent display circuit.
Example 3	Input signal does not turn OFF.	• Leakage current due to line capacity of wiring cable. (Line capacity C of twisted pair wire is approx. 100 PF/m). 	• Same as Example 1. • However, leakage current is not generated when the power supply is located in the input equipment side as shown below. 
Example 4	Input signal does not turn OFF.	• Drive by switch with LED indicator. 	• Connect a register which will make the voltage between the input module terminal and common higher than the OFF voltage, as shown below.  (Note-1) : A calculation example of a value for a connected resistor is given on the following page.

Input Circuit Troubleshooting and Corrective Action (Continued)

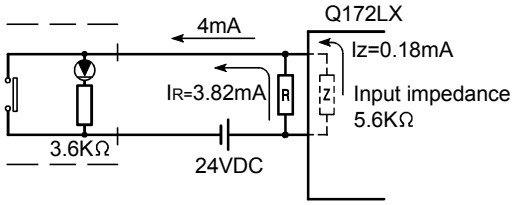
	Condition	Cause	Corrective action
Example 5	Input signal does not turn OFF.	• Sneak path due to the use of two power supplies. 	• Use only one power supply. • Connect a sneak path prevention diode. (Figure below) 
Example 6	False input due to noise	Depending on response time setting, noise is imported as input.	Change response time setting. Example : 10ms → 20ms

<Calculation example of Example 4>

For the case with a limit switch with LED indicator connected to Q172LX, causing 4 mA leak current.



(a) The 0.18 mA OFF current of the Q172LX is not satisfied. Hence, connect a resistor as shown below.



(b) Calculate the resistor value R as indicated below.

To satisfy the 0.18 mA OFF current of the Q172LX, the resistor R to be connected may be the one where 3.82 mA or more will flow.

I_R: I_Z=Z(Input impedance): R

$$R \leqq \frac{I_Z}{I_R} \times Z(\text{Input impedance}) = \frac{0.18}{3.82} \times 5.6 \times 10^3 = 264[\Omega]$$

R<264Ω.

Assuming that resistor R is 220Ω, the power capacity W of resistor R is:

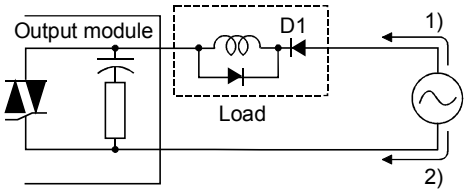
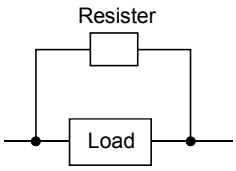
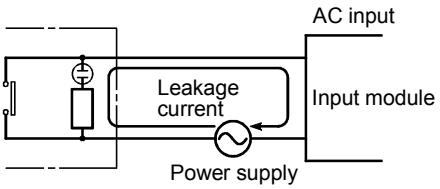
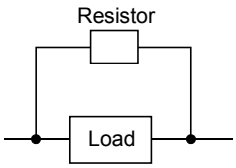
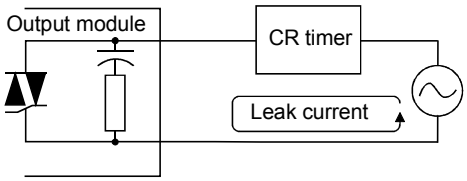
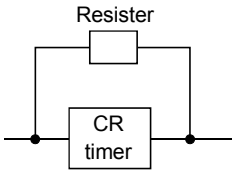
W = (Input voltage)^2 ÷ R = 26.4^2 ÷ 220 = 3.168 [W]

(c) The power capacity of the resistor selected is 3 to 5 times greater than the actual current consumption. 220 [Ω], 10 to 15 [W] resistor may therefore be connected to the terminal in question.

(2) Output circuit troubleshooting and corrective action

This section describes troubleshooting with output circuits and their corrective actions.

Output Circuit Troubleshooting and Corrective Action

	Condition	Cause	Corrective action
Example 1	Overvoltage applied to load when output turns OFF	• If load is internally half-wave rectified (some solenoids are like this).  • With polarity 1), C is charged. With polarity 2),the C charge voltage plus the power supply voltage is applied across D1. Max. voltage is approx. 2.2E.	• Connect a resistor between several tens k Ω and several hundreds k across the load. This method causes no problems with output terminals but lead to deterioration or burnout of load internal diodes. 
Example 2	Load does not turn OFF (Triac output).	• Leak current due to internal surge suppressor. 	• Connect a resistor across the load. If long wring exists between the output card and the load, leak currents also arise due to wiring capacity. 
Example 3	Time period fluctuates when load is a CR timer (Triac output)		• Drive a relay and use the relay contacts to drive the CR timer. See note attached to Example 1, as some timers are half-wave rectified internally.  Calculate resister constant from load.

6.6 Error Code

When the Multiple CPU system power supply is turned on and M.RUN is running or trouble occurs during the running, the Motion CPU displays an error (by LED) using the self-diagnosis function, and stores the error information in the special relay M9010 and special register D9008.

6.6.1 Procedure for reading error codes

When an error occurs, the error code and error message can be read by the personal computer installation of the SW6RN-GSV□P.
The procedure for reading error codes to the personal computer(IBM PC/AT) which is installed the SW6RN-GSV□P is as follows.

1) Start the SW6RN-GSV□P.
2) Connect the Motion CPU to the personal computer(IBM PC/AT) .
3) Select [Create a new project] - [Motion CPU Read] Menu by the SW6RN-GSV□P, and also read the project from the Motion CPU.
4) Select the [Monitor] - [PV Enlarged Monitor] Menu.
5) Display the error code and error message.
6) Select the [Monitor] - [Error List (E)] - [Error List], and confirm the content of the applicable error code.

For details of the SW6RN-GSV□P operating method, refer to help of each programming soft ware package.

MEMO

APPENDICES

APPENDIX 1 Cables

APPENDIX 1.1 SSCNET cables

Generally use the SSCNET cables available as our options. If the required length is not found in our options, fabricate the cable on the customer side.

(1) Selection

The following table indicates the SSCNET cables used with each motion controller and the servo amplifiers. Make selection according to your operating conditions.

Table 1 Table of SSCNET cable

Type	Description
Q172J2BCBL□M(-B)	• Q172CPU(N) ↔ MR-J2□-B
Q172HBCBL□M(-B)	• Q172CPU(N) ↔ MR-H-BN
Q173DVCBL□M	• Q173CPU(N) ↔ Q173DV
Q173J2B△CBL□M	• Q173CPU(N) ↔ MR-J2□-B
Q173HB△CBL□M(-B)	• Q173CPU(N) ↔ MR-H-BN
MR-J2HBUS□M	• MR-J2□-B ↔ MR-J2□-B • Q173DV ↔ MR-J2□-B
MR-J2HBUS□M-A	• MR-H-BN ↔ MR-J2□-B • Q173DV ↔ MR-H-BN
MR-HBUS□M	• MR-H-BN ↔ MR-H-BN

Use the following or equivalent twisted pair cables as the SSCNET cables.

Table 2 Table of wire model

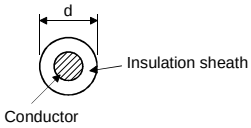
Type	Length [m(ft.)]	Wire model
Q172J2BCBL□M(-B)	0.5(1.64), 1(3.28), 5(16.4)	UL20276 AWG#28 7 pair(CREAM)
Q172HBCBL□M(-B)		
Q173DVCBL□M	0.5(1.64), 1(3.28)	UL20276 AWG#28 13 pair(CREAM)
Q173J2B△CBL□M	0.5(1.64), 1(3.28), 5(16.4)	UL20276 AWG#28 7 pair(CREAM)
Q173HB△CBL□M(-B)		
MR-J2HBUS□M		UL20276 AWG#28 10 pair(CREAM)
MR-J2HBUS□M-A		
MR-HBUS□M		A14B2343 6 Pair

App.

Table 3 Table of wire specifications

Wire model	Core size [mm^2]	Number of cores	Characteristics of one core			Finish OD [mm] (Note-2)
			Structure [Number of wires/mm]	Conductor resistance [Ω/km]	Insulating sheath OD d[mm] (Note-1)	
UL20276 AWG#28 7 pair(CREAM)	0.08	14(7 pairs)	7/0.127	Max.222	0.38	5.5
UL20276 AWG#28 10 pair(CREAM)	0.08	20(10 pairs)	7/0.127	Max.222	0.38	6.1
UL20276 AWG#28 13 pair(CREAM)	0.08	26(13 pairs)	7/0.127	Max.222	0.38	6.5
A14B2343 6P	0.2	12(6 pairs)	40/0.08	Max.105	0.88	7.2

(Note-1): d is as shown below.



(Note-2): Standard OD. Max. OD is about 10% larger.

⚠ CAUTION

- When fabricating the bus cable, do not make incorrect connection. Wrong connection will cause runaway or explosion.

(a) Q172J2BCBL□M(-B)

1) Model explanation

Type: Q172J2BCBL□M-∗

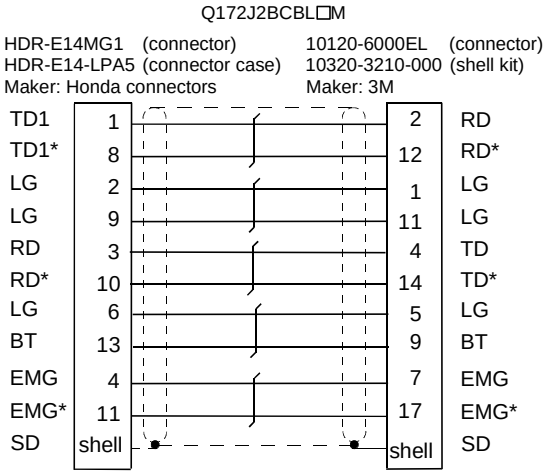
Symbol	Connect Battry unit
None	No
B	Yes

Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)
5	5(16.4)

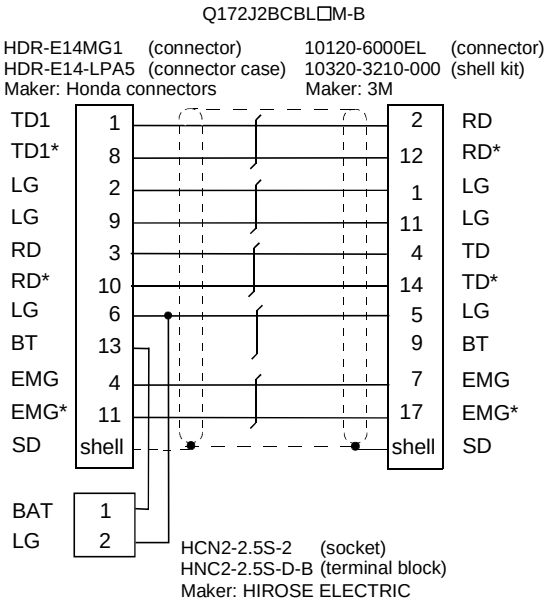
2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .

• Q172J2BCBL□M



• Q172J2BCBL□M-B



(b) Q172HBCBL□M(-B)

1) Model explanation

Type: Q172HBCBL□M-∗

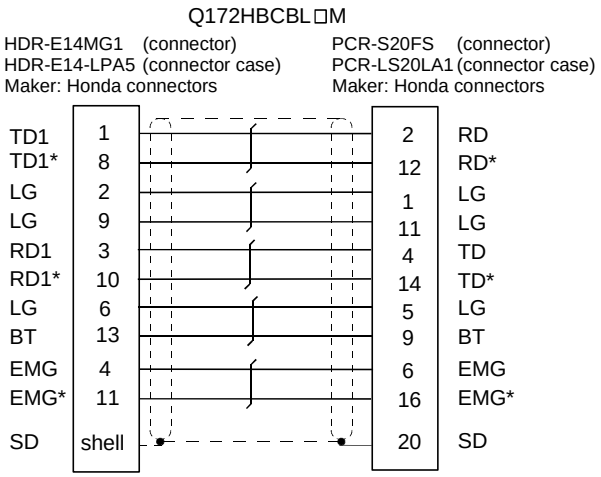
Symbol	Connect Battry unit
None	No
B	Yes

Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)
5	5(16.4)

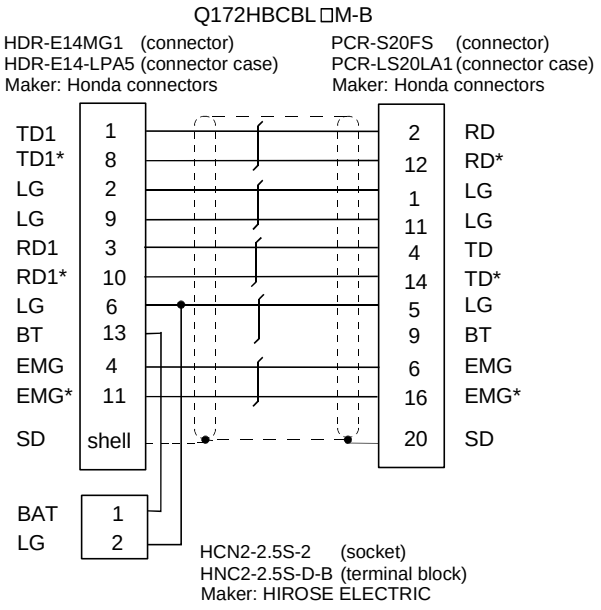
2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .

• Q172HBCBL□M



• Q172HBCBL□M-B



(c) Q173DVCBL□M

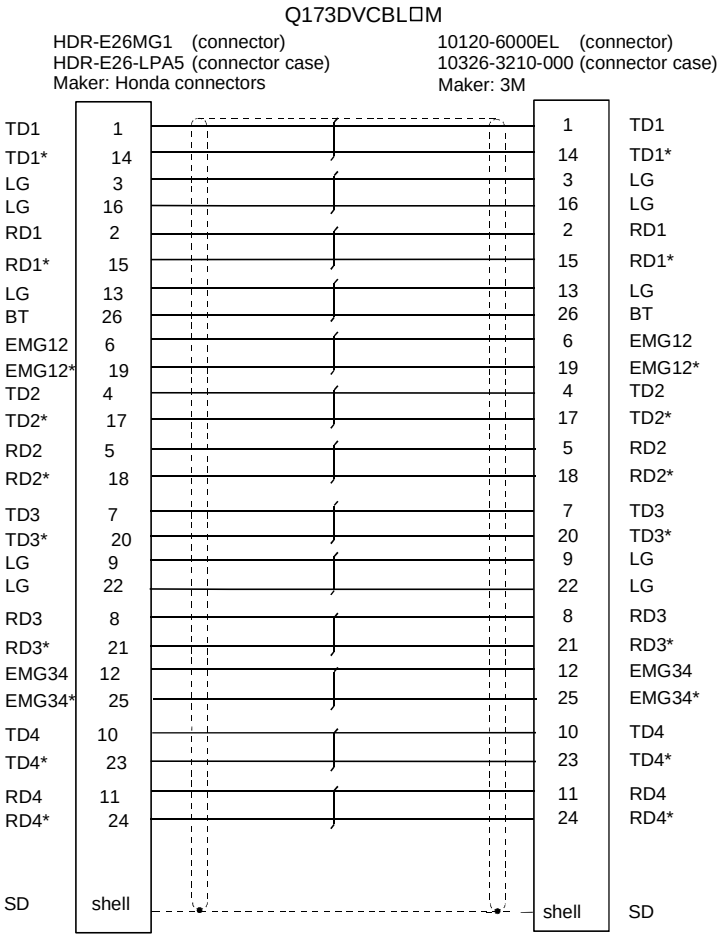
1) Model explanation

Type: Q173DVCBL□M

Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)

2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .



(d) Q173J2B△CBL□M

1) Model explanation

Type: Q173J2B△CBL□M

Symbol	Number of SSCNET LINE
none	SSCNET LINE1
2	SSCNET LINE2
3	SSCNET LINE3
4	SSCNET LINE4

Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)
5	5(16.4)

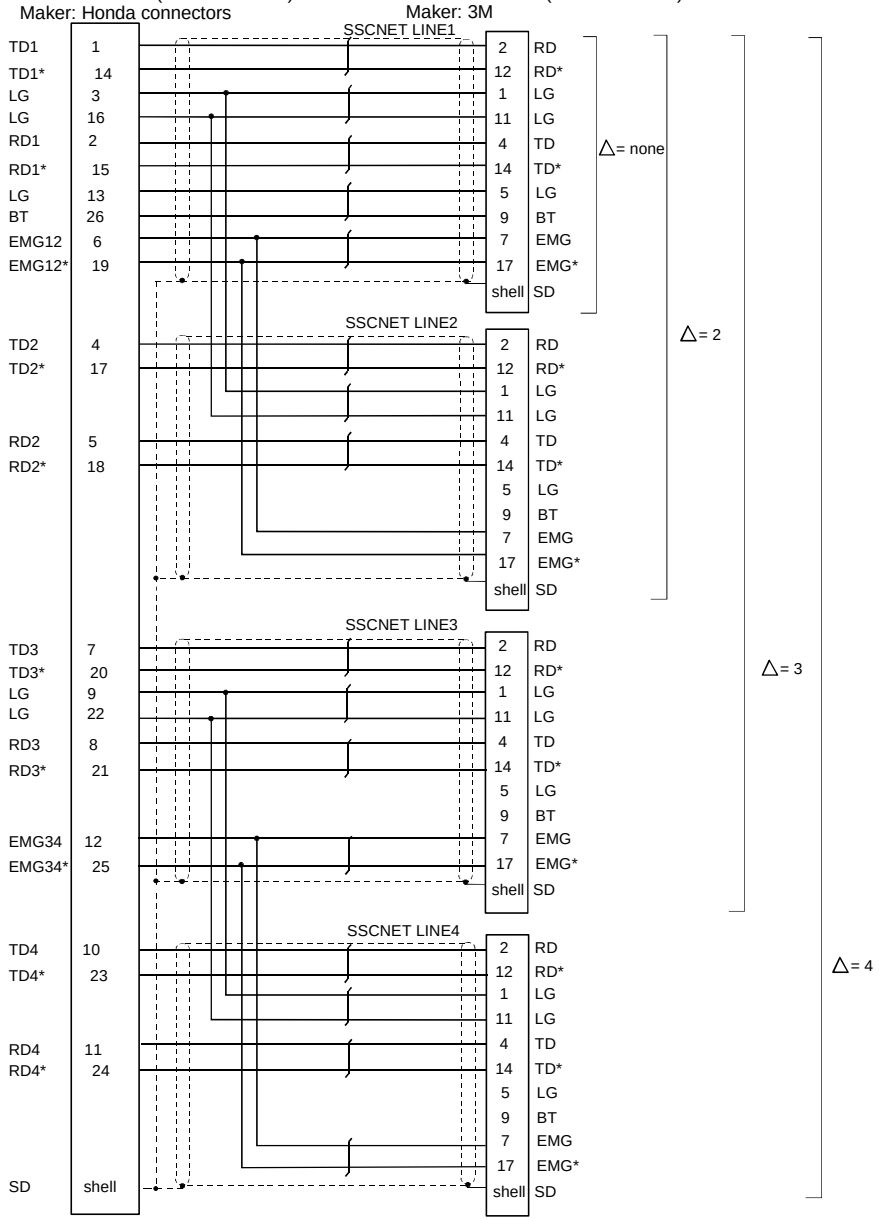
2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .

Q173J2B△CBL□M Example: △ = 4

HDR-E26MG1 (connector)
HDR-E26-LPA5 (connector case)
Maker: Honda connectors

10120-6000EL (connector)
10320-3210-000 (connector case)
Maker: 3M



(e) Q173HB△CBL□M

1) Model explanation

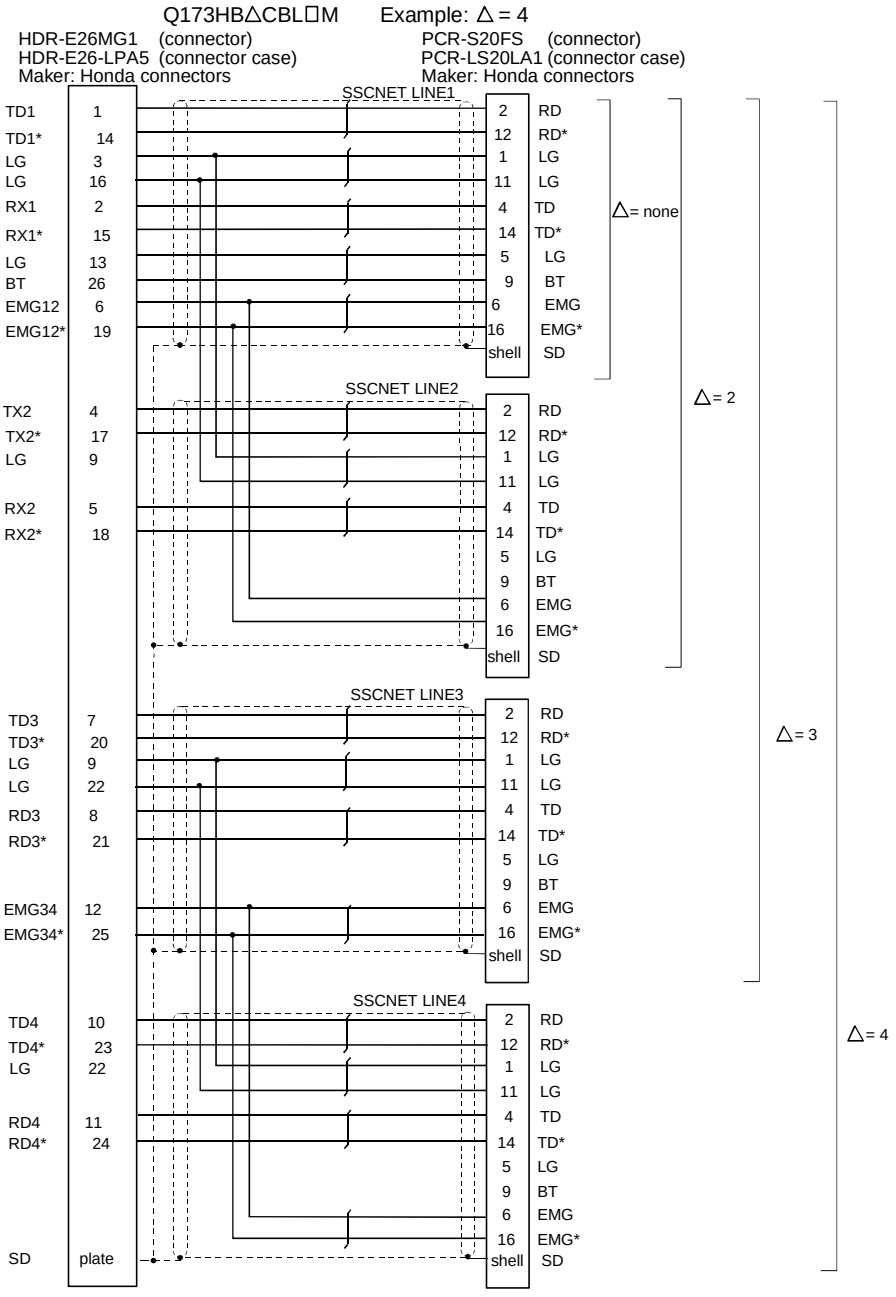
Type: Q173HB△CBL□M

Symbol	Number of SSCNET LINE
none	SSCNET LINE1
2	SSCNET LINE2
3	SSCNET LINE3
4	SSCNET LINE4

Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)
5	5(16.4)

2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .



(f) MR-J2HBUS□M

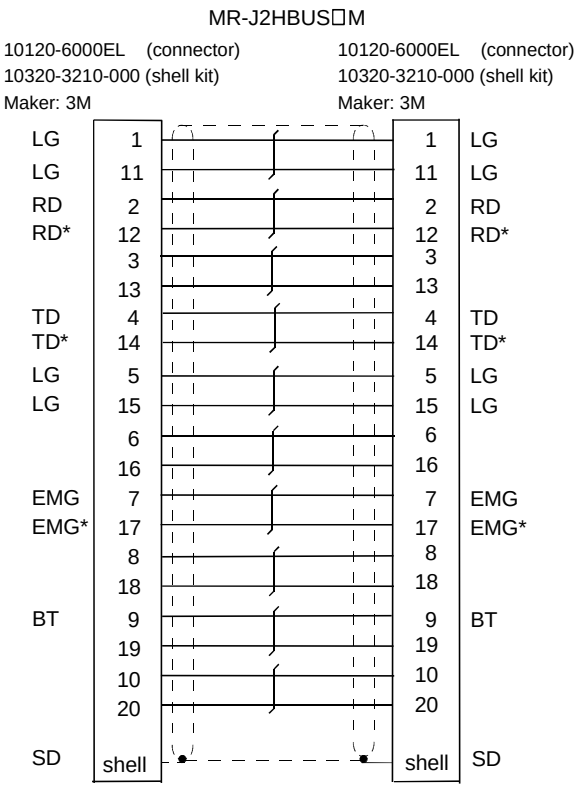
1) Model explanation

Type: MR-J2HBUS□M

Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)
5	5(16.4)

2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .



(g) MR-J2HBUS□M-A

1) Model explanation

Type: MR-J2HBUS□M-A

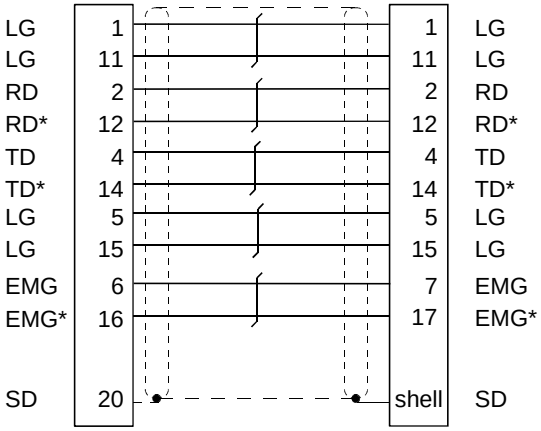
Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)
5	5(16.4)

2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .

MR-J2HBUS□M-A

PCR-S20FS (connector) 10120-6000EL (connector)
PCR-LS20LA1 (connector case) 10320-3210-000 (shell kit)
Maker: Honda connectors Maker: 3M



(h) MR-HBUS□M

1) Model explanation

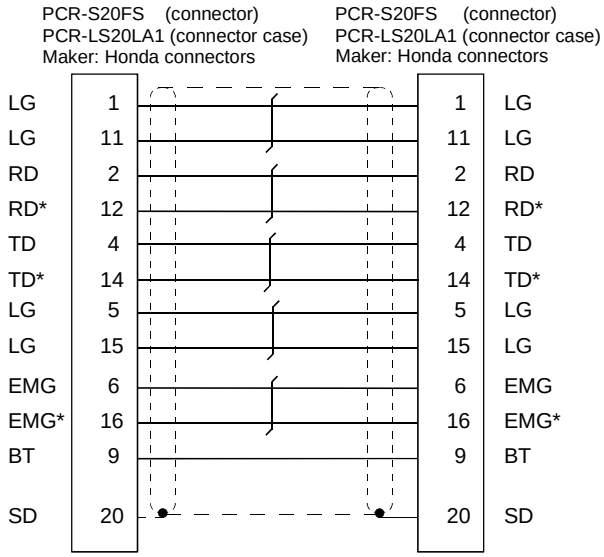
Type: MR-HBUS□M

Symbol	Cable length [m(ft.)]
05	0.5(1.64)
1	1(3.28)
5	5(16.4)

2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m(98.4ft.) .

MR-HBUS□M



APPENDIX 1.2 Serial absolute synchronous encoder cable

Generally use the Serial absolute synchronous encoder cables available as our options. If the required length is not found in our options, fabricate the cable on the customer side.

(1) Selection

The following table indicates the Serial absolute synchronous encoder cables used with the servomotors.

Make selection according to your operating conditions. Connector sets(MR-J2CNS) are also available for your fabrication.

Table 1 Table of wire model

Type	Length [m(ft.)]	Wire model
MR-JHSCBL□M-L	2(6.56), 5(16.4)	UL20276 AWG#28 4 pair(BLAC)
	10(32.8), 20(65.6), 30(98.4)	UL20276 AWG#22 6 pair(BLAC)
MR-JHSCBL□M-H	2(6.56), 5(16.4)	A14B2339 4 pair
	10(32.8), 20(65.6), 30(98.4)	A14B2343 6 pair

Use the following or equivalent twisted pair cables as the Serial ABS synchronous encoder cables.

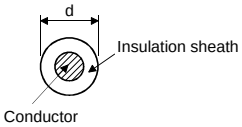
Table 2 Table of connector set

Encoder cable type	Connector sets type	Description
MR-JHSCBL□M-L	MR-J2CNS	• Connector shell kits • Plug cable clump
MR-JHSCBL□M-H		

Table 3 Table of wire specifications

Wire model	Core size [mm^2]	Number of cores	Characteristics of one core			Finish OD [mm] (Note-2)
			Structure [Number of wires/mm]	Conductor resistance [Ω/km]	Insulating sheath OD d[mm] (Note-1)	
UL20276 AWG#28 4P(BLAC)	0.08	8(4 pairs)	4/0.127	Max.222	0.38	4.7
UL20276 AWG#22 6P(BLAC)	0.3	12(6 pairs)	12/0.127	Max.62	1.2	8.2
A14B2343 6P	0.2	12(6 pairs)	40/0.08	Max.105	0.88	7.2
A14B2339 4P	0.2	8(4 pairs)	40/0.08	Max.105	0.88	6.5

(Note-1): d is as shown below.



(Note-2): Standard OD. Max. OD is about 10% larger.

⚠ CAUTION

● When fabricating the encoder cable, do not make incorrect connection. Wrong connection will cause runaway or explosion.

(2) MR-JHSCBL□M-L/H

Synchronous encoder cable is the same encoder cables of the HC-SF/HC-RFS/HC-UFS 2000 r/min series servomotors

1) Model explanation

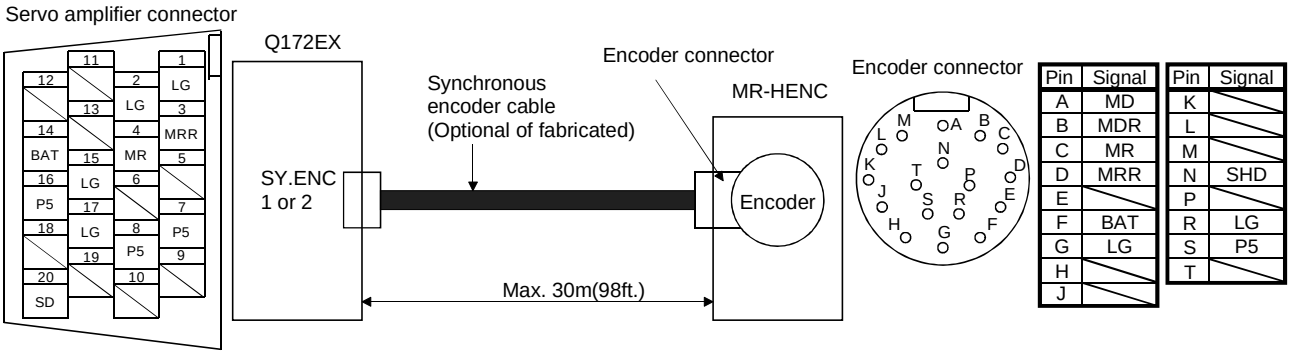
Type: MR-JHSCBL□M-□

Symbol	Specifications
L	Standard flexing life
H	Long flexing life

Symbol	Cable length [m(ft.)]
2	2(6.6)
5	5(16.4)
10	10(32.8)
20	20(65.6)
30	30(98.4)

2) Connection diagram

When fabricating a cable, use the recommended wire given on Appendix 1.1, and make the cable as show in the following connection diagram. The overall distance of the SSCNET cables on the same bus is 30m.

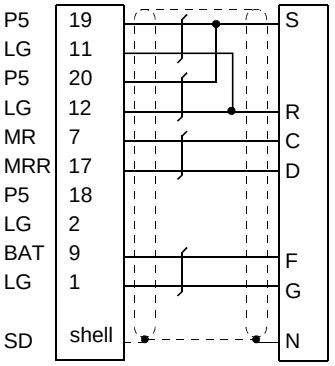


Pin	Signal
A	MD
B	MDR
C	MR
D	MRR
E	
F	BAT
G	LG
H	
J	

Pin	Signal
K	
L	
M	
N	SHD
P	
R	LG
S	P5
T	

MR-JHSCBL2M-L,MR-JHSCBL5M-L
MR-JHSCBL2M-H,MR-JHSCBL5M-H

Servo amplifier side: PCR-S20FS (connector), PCR-LS20LA1(shell kit), Maker: Honda connectors
Encoder side: MS3106B20-29S(plug), MS-3057-12A(cable clump), Maker: Japan Aviation Electronics Industry (JAE)

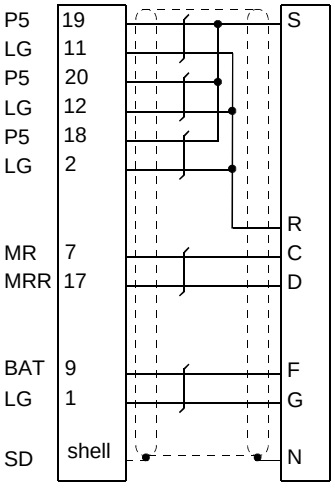


AWG24 used (Note-1)
(for less than 10[m](32.8[ft.]))

(Note-1) : AWG28 can be used for 5m or less.

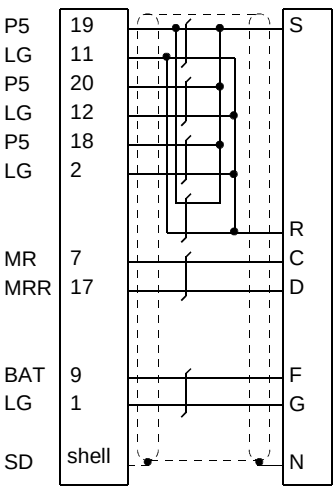
MR-JHSCBL10M-L to MR-JHSCBL30M-L

Servo amplifier side: PCR-S20FS(connector), PCR-LS20LA1(shell kit), Maker: Honda connectors
Encoder side: MS3106B20-29S(plug), MS-3057-12A(cable clump), Maker: Japan Aviation Electronics Industry (JAE)



MR-JHSCBL10M-H to MR-JHSCBL30M-H

Servo amplifier side: PCR-S20FS(connector), PCR-LS20LA1(shell kit), Maker: Honda connectors
Encoder side: MS3106B20-29S(plug), MS-3057-12A(cable clump), Maker: Japan Aviation Electronics Industry (JAE)

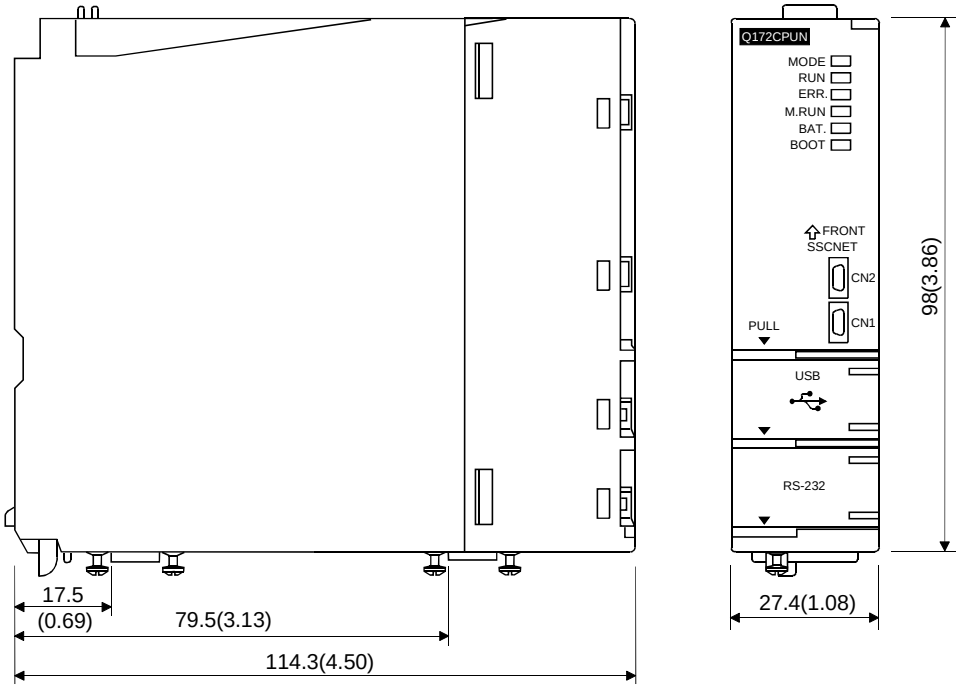


APPENDIX 2 Exterior Dimensions Diagram

APPENDIX 2.1 CPU module

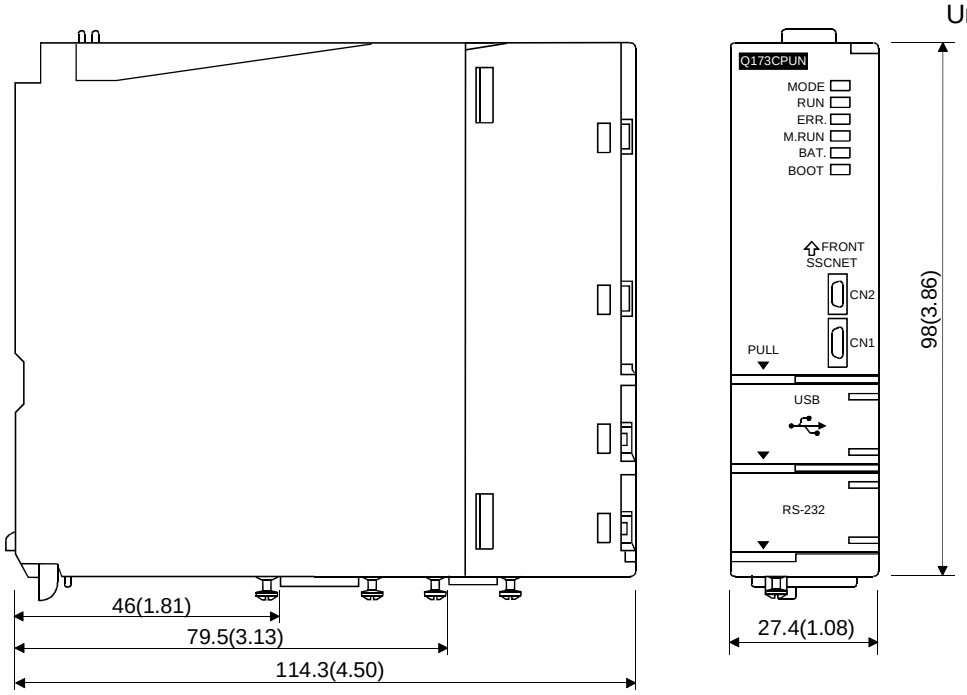
(1) Q172CPUN Module

Unit: mm (inch)



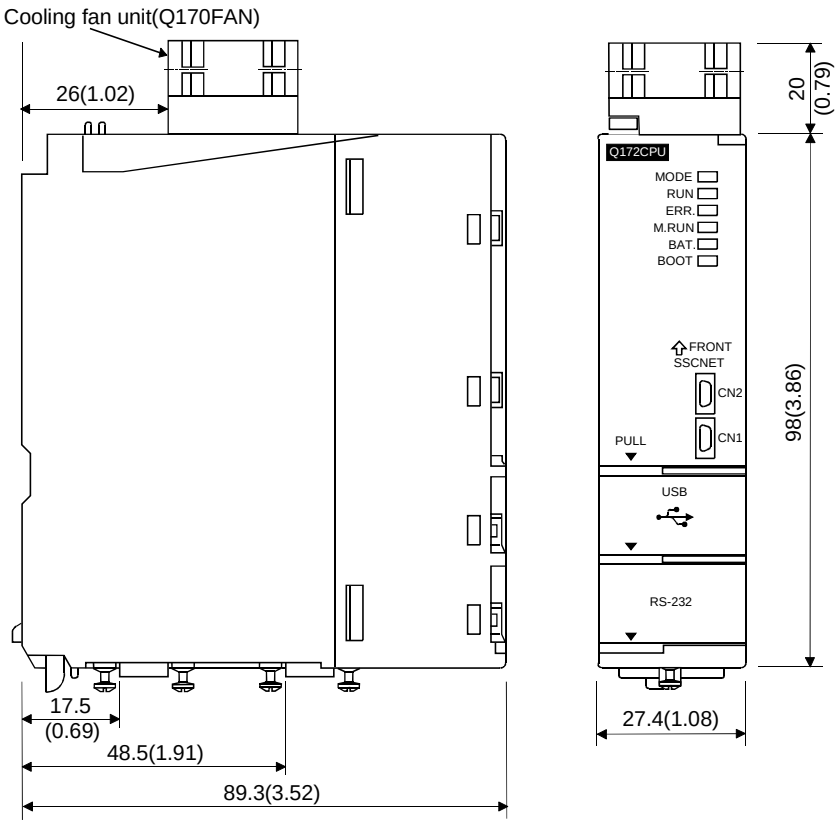
(2) Q173CPUN Module

Unit: mm (inch)



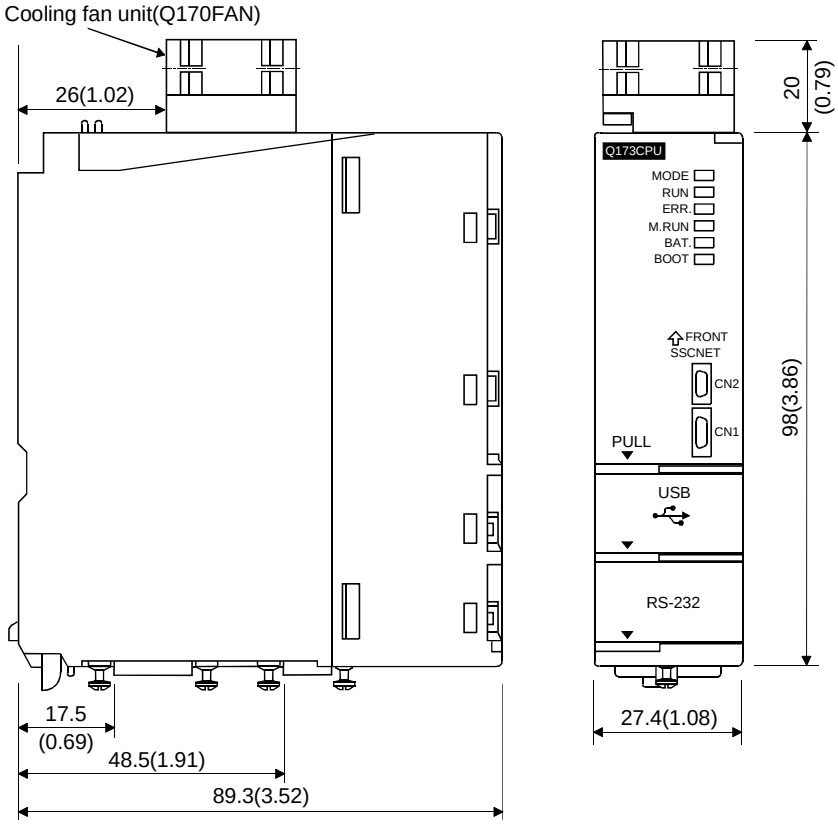
(3) Q172CPU Module

Unit: mm (inch)



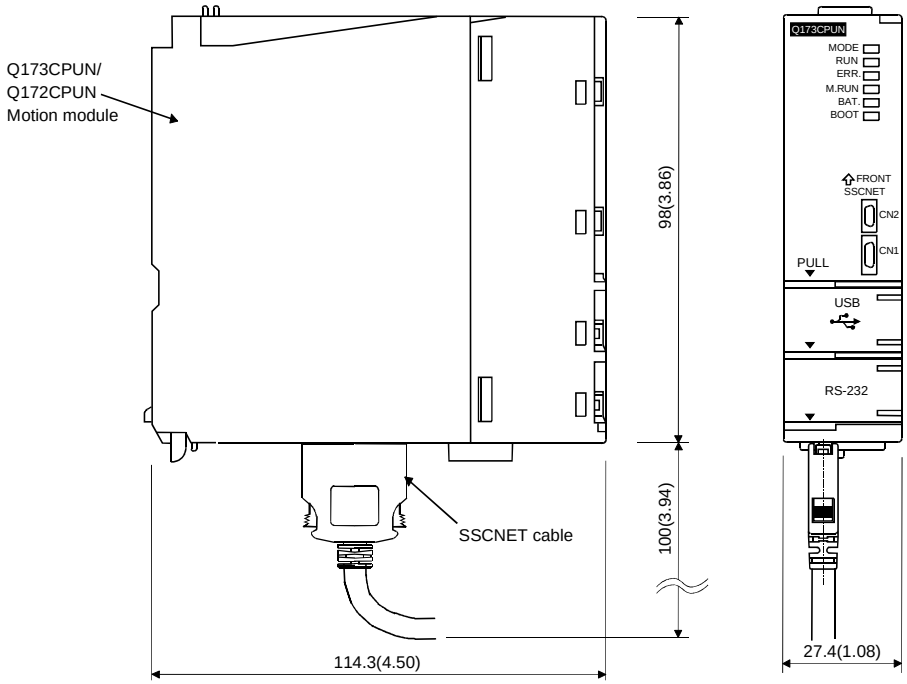
(4) Q173CPU Module

Unit: mm (inch)



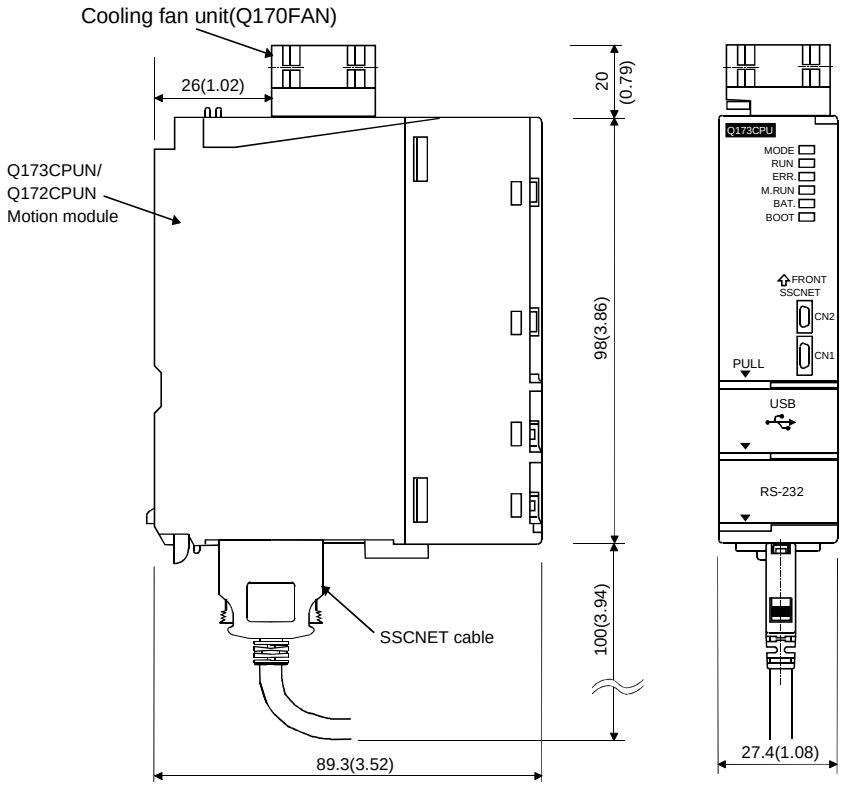
(5) Q173CPUN/Q172CPUN Module (with SSCNET cable)

Unit: mm (inch)



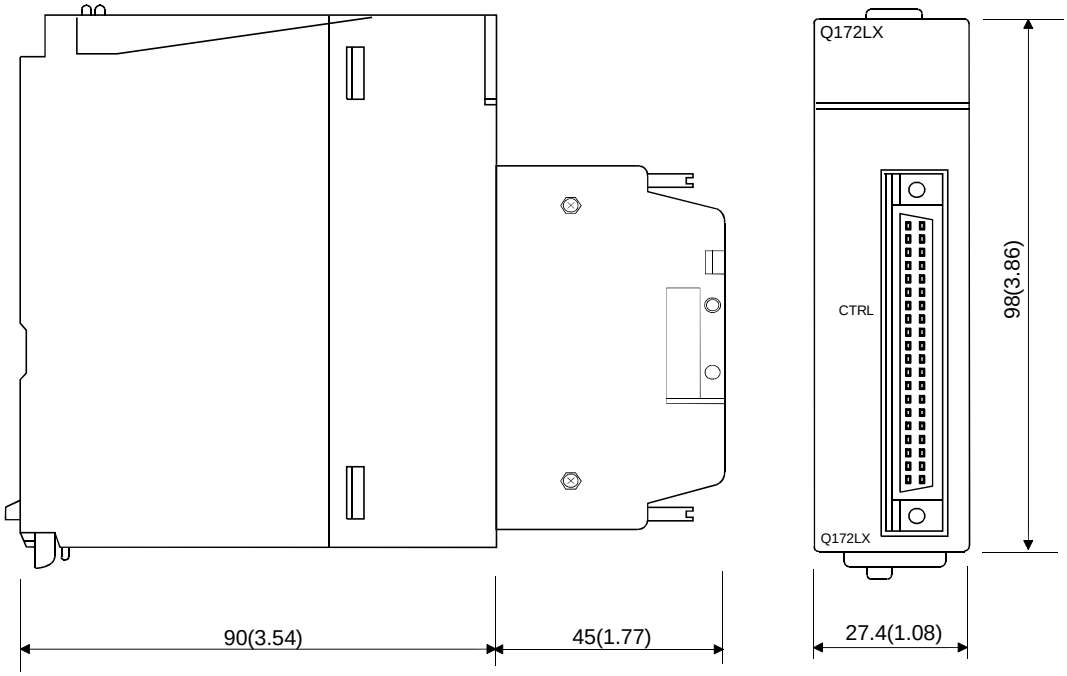
(6) Q173CPU/Q172CPU Module (with SSCNET cable)

Unit: mm (inch)



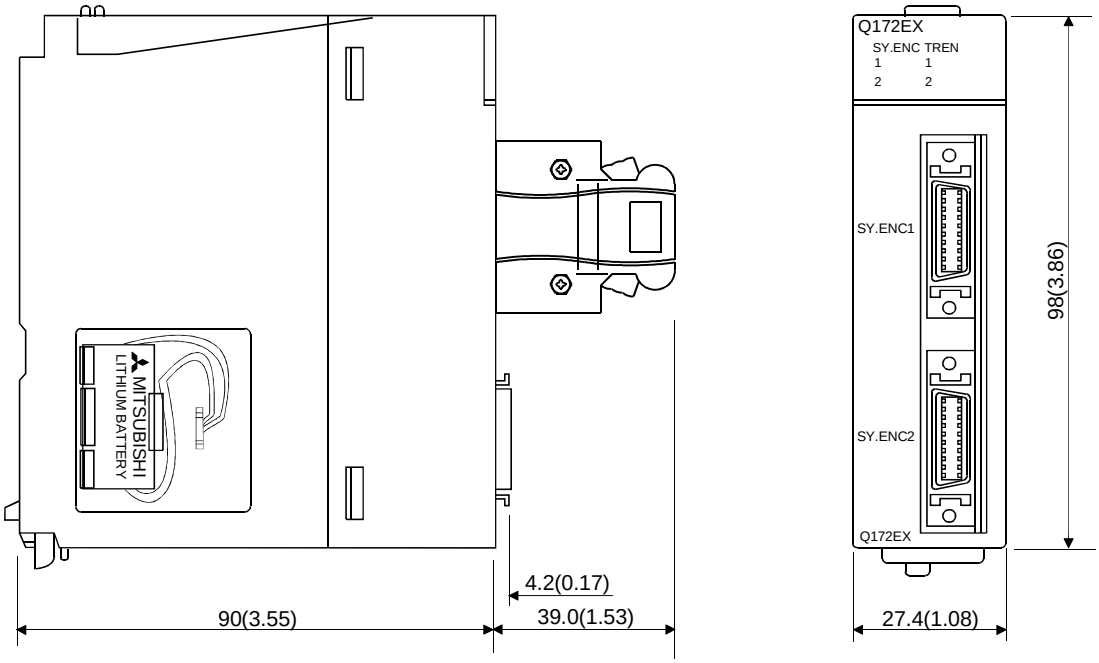
APPENDIX 2.2 Servo external signals interface module (Q172LX)

Unit: mm (inch)



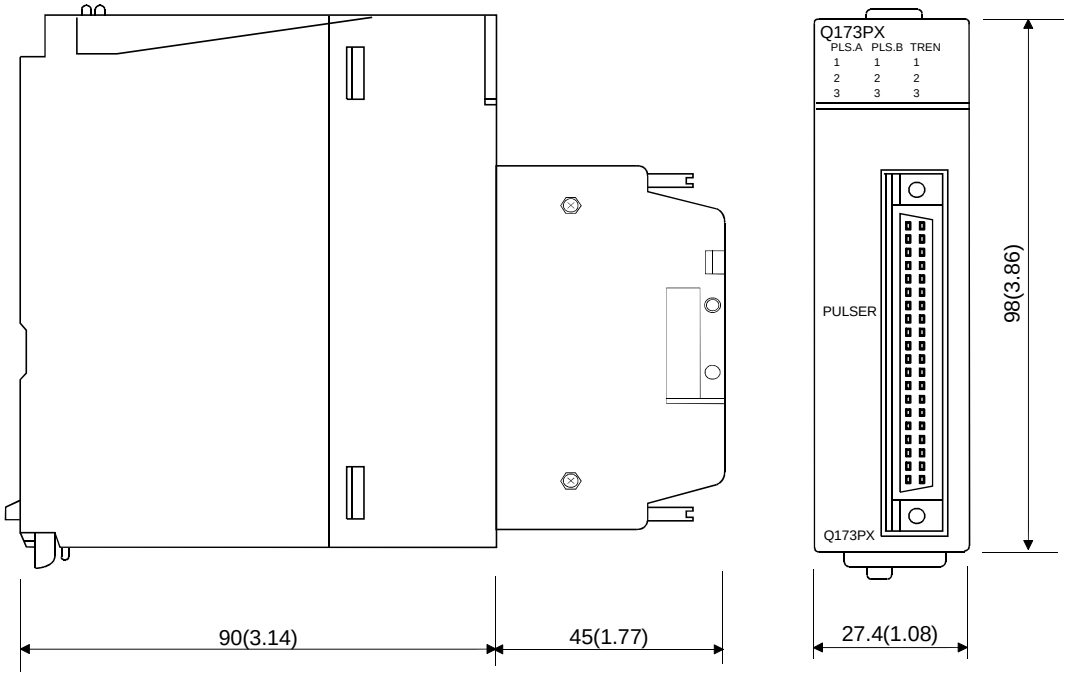
APPENDIX 2.3 Serial absolute synchronous encoder interface module (Q172EX)

Unit: mm (inch)



APPENDIX 2.4 Manual pulse generator interface module (Q173PX)

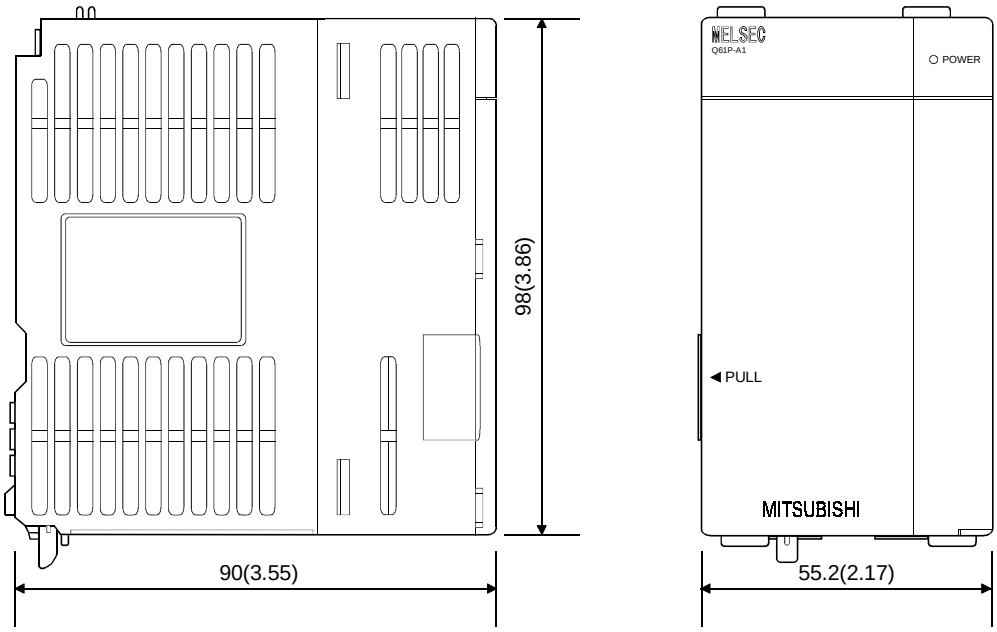
Unit: mm (inch)



APPENDIX 2.5 Power supply module (Q61P-A1, Q61P-A2, Q63P, Q64P)

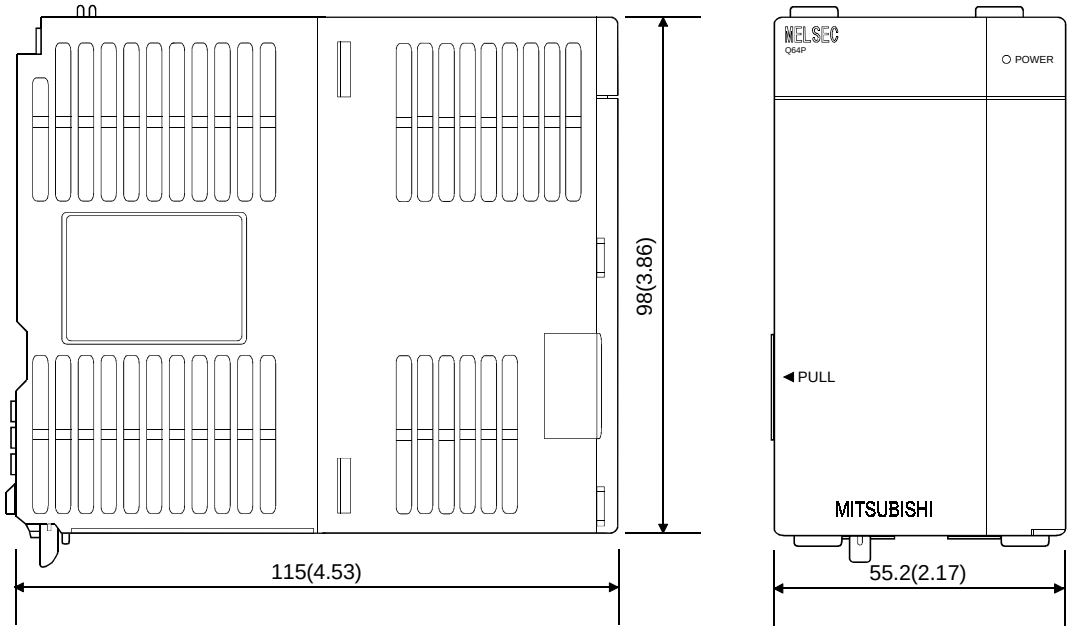
Unit: mm (inch)

(1) Q61P-A1, Q61P-A2, Q63P



(2) Q64P

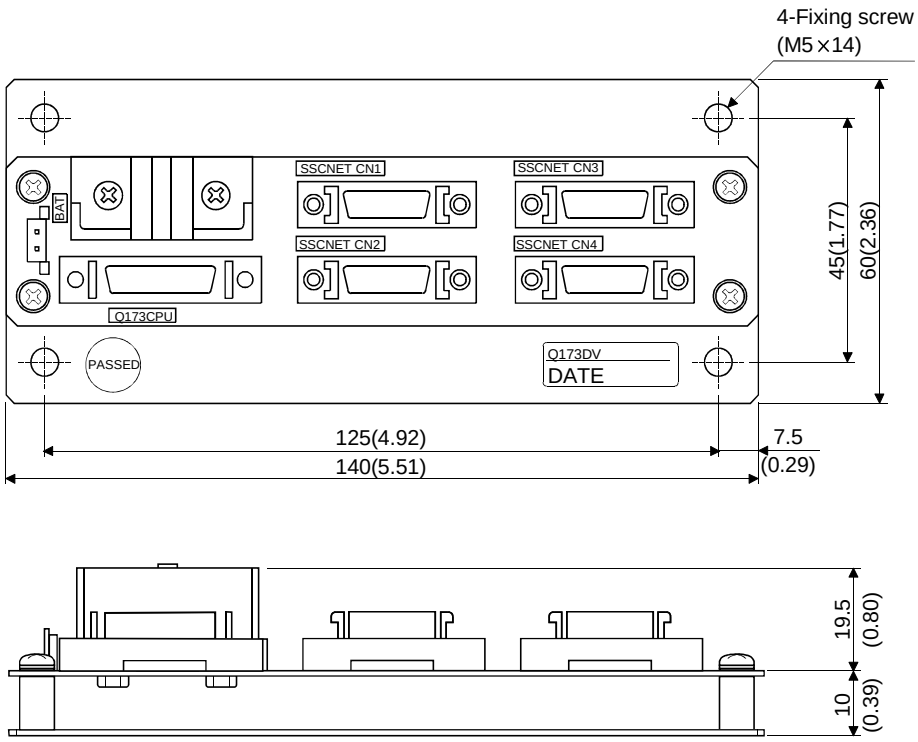
Unit: mm (inch)



APPENDIX 2.6 Dividing unit (Q173DV), Battery unit (Q170BAT)

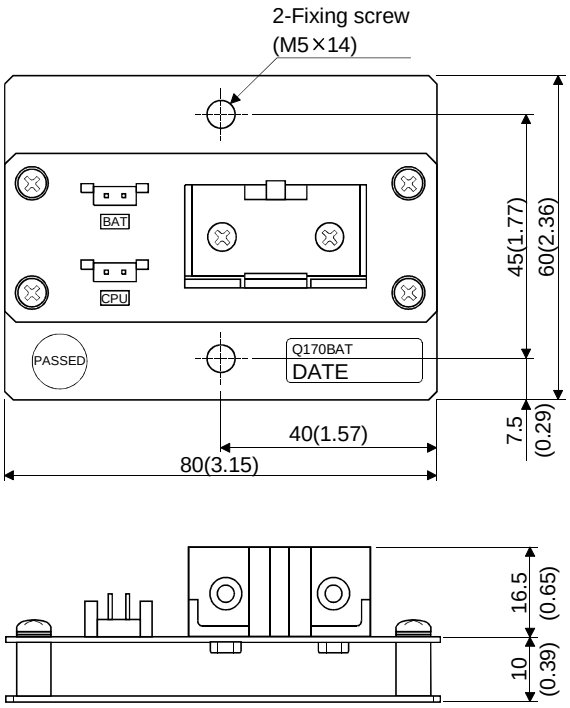
(1) Dividing unit (Q173DV)

Unit: mm (inch)



(2) Battery unit (Q170BAT)

Unit: mm (inch)



APPENDIX 2.7 Connector

(1) Honda connectors make(HDR model)

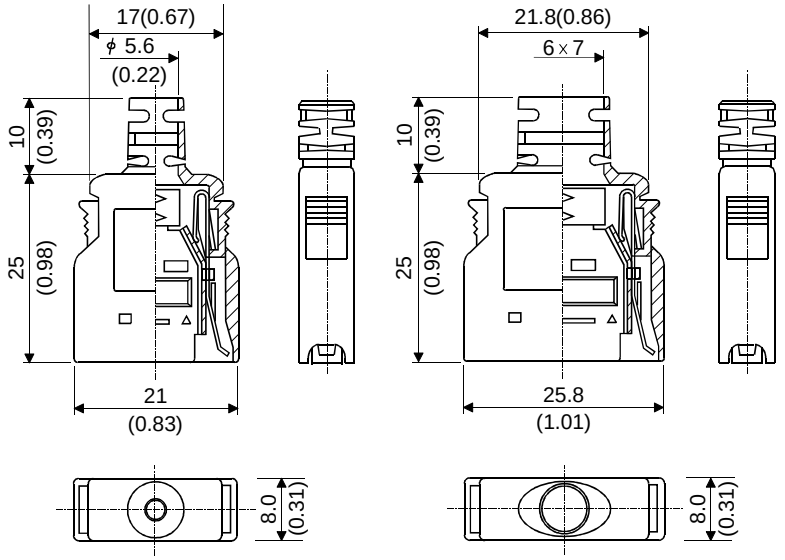
Number of pins	Type	
	Connector	Connector case
14	HDR-E14MG1	HDR-E14LPA5
26	HDR-E26MG1	HDR-E26LPA5

Specified tool: FHAT-0029/FHPT-0004C
Maker: Honda connectors
These connectors are not sold in Mitsubishi. They are requested to be procured by customers.

Type Connector : HDR-E14MG1
Connector case: HDR-E14LPA5

Type Connector : HDR-E26MG1
Connector case: HDR-E26LPA5

Unit: mm (inch)



(2) Sumitomo 3M make(MDR type)

Number of pins	Type	Type	
		Connector	Connector case
20	Solder connection type (Quick release metal latch type)	10120-3000VE	10320-52F0-008
	Solder connection type (Threaded type)	10120-3000VE	10320-52A0-008
	Insulation displacement type (Quick release metal latch type)	10120-6000EL(Note)	10320-3210-000(Note)
26	Solder connection type (Quick release metal latch type)	10126-3000VE	10326-52F0-008
	Solder connection type (Threaded type)	10126-3000VE(Note)	10326-52A0-008(Note)
	Insulation displacement type (Quick release metal latch type)	10126-6000EL(Note)	10326-3210-000(Note)

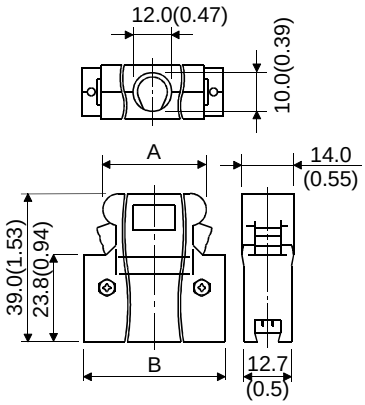
(Note): These connectors are not options, and should be prepared by the customer.

(a) Solder connection type(Quick release metal latch type)

Type Connector : 10120-3000VE/10126-3000VE

Connector case: 10320-52F0-008/10326-52F0-008

Unit: mm (inch)



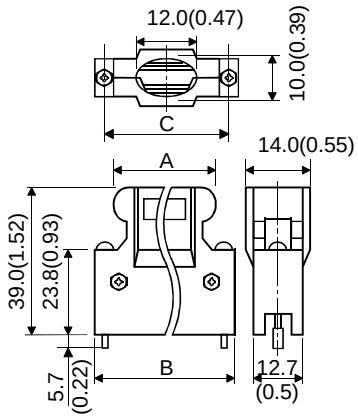
Number of pins	A	B
20 pin	22.0(0.87)	33.3(1.31)
26 pin	25.8(1.02)	37.2(1.46)

(b) Solder connection type(Threaded type)

Type Connector : 10120-3000VE/10126-3000VE

Connector case: 10320-52A0-008/10326-52A0-008

Unit: mm (inch)



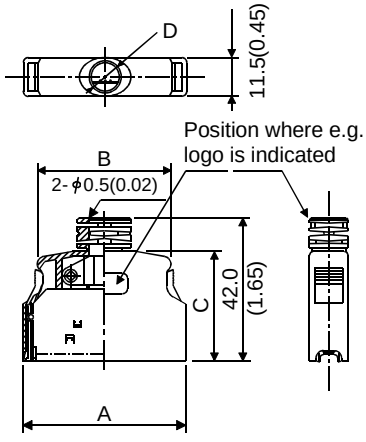
Number of pins	A	B	C
20 pin	22.0(0.87)	33.3(1.31)	27.4(1.08)
26 pin	25.8(1.02)	37.2(1.46)	31.3(1.23)

(c) Insulation displacement type(Quick release metal latch type)

Type Connector : 10120-6000EL/10126-6000EL

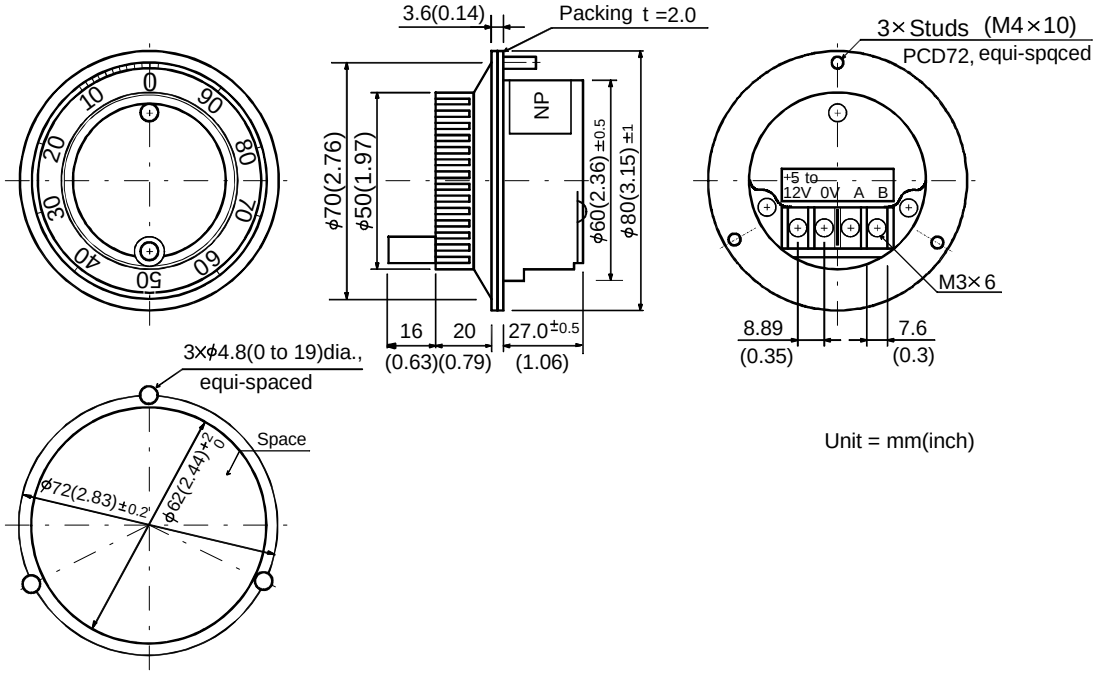
Connector case: 10320-3210-000/10326-3210-000

Unit: mm (inch)



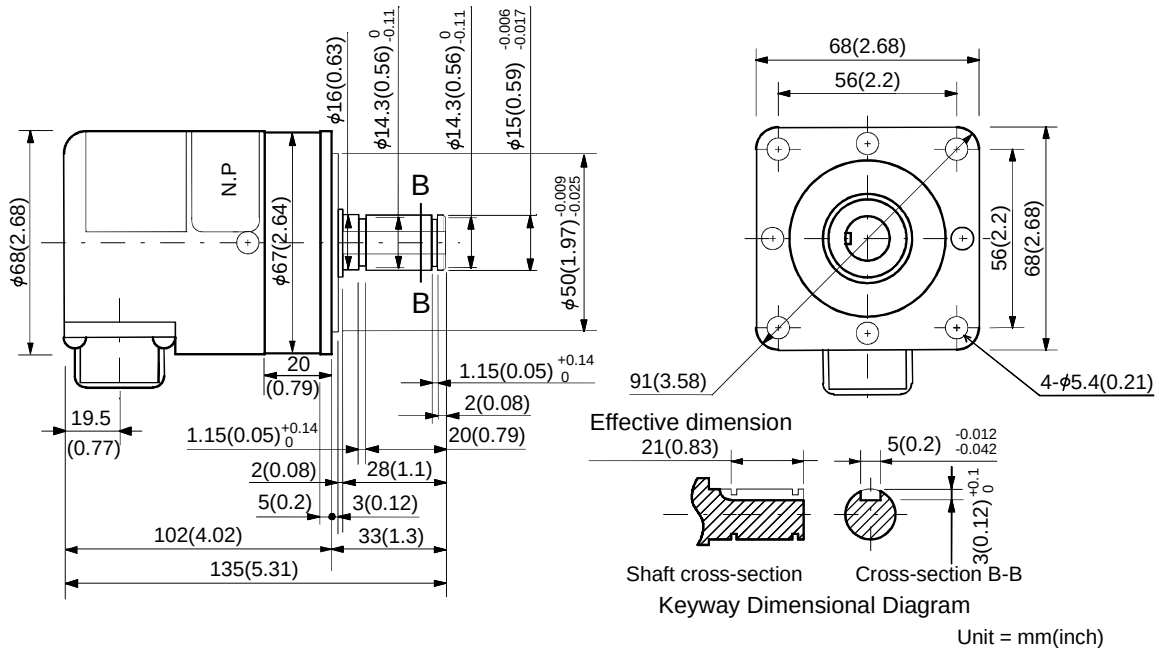
Number of pins	A	B	C	D
20 pin	29.7(1.17)	20.9(0.82)	33.0(1.30)	φ6.7
26 pin	33.5(1.32)	24.8(0.97)	33.0(1.30)	φ6.7

APPENDIX 2.8 Manual pulse generator (MR-HDP01)



The figure of processing a disc

APPENDIX 2.9 Serial absolute synchronous encoder (MR-HENC)

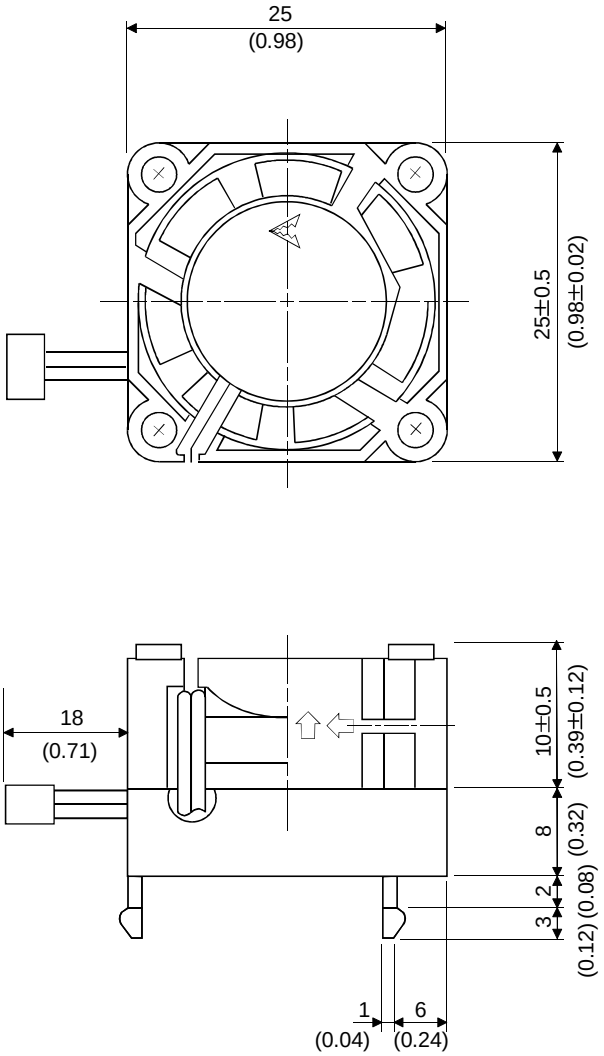


Unit = mm(inch)

APPENDIX 2.10 Cooling fan unit (Q170FAN) (Q173CPU/Q172CPU only)

(1) Cooling fan unit (Q170FAN)

Unit: mm (inch)



FOR MAXIMUM SAFETY

(1) This product is not designed or manufactured to be used in equipment or systems in situations that can affect or endanger human life.

(2) When considering this product for operation in special applications such as machinery or systems used in passenger transportation, medical, aerospace, atomic power, electric power or submarine repeating applications, please contact your nearest Mitsubishi sales representative.

(3) Although this product was manufactured under conditions of strict quality control, you are strongly advised to install safety devices to forestall serious accidents when it is used in facilities where a breakdown in the product is likely to cause a serious accident.

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